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SECOND EDITION

VOLUME XXII

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1916

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KEY TO PRONUNCIATION

For a full explanation of the various sounds indicated, see the KEY TO PRONUNCIATION in Vol. I.

ā as in ale, fate.
ā̇ " " senate, chaotic.
â " " glare, care, and as *e* in there.
ă " " am, at.
ä " " arm, father.
ȧ " " ant, and final *a* in America, armada, etc.
a " " final, regal, pleasant.
ạ " " all, fall.
ē " " eve.
ē̇ " " elate, evade.
ĕ " " end, pet.
ẽ " " fern, her, and as *i* in sir, etc.
e " " agency, judgment.
ī " " ice, quiet.
ī̇ " " quiescent.
ĭ " " ill, fit.
ō " " old, sober.
ō̇ " " obey, sobriety.
ô " " orb, nor.
ŏ " " odd, forest, not.
o " " atom, carol.
oi " " oil, boil.
o͞o " " food, fool, and as *u* in rude, rule.
ou " " house, mouse.
ū " " use, mule.
ū̇ " " unite.
ŭ " " cut, but.
ṳ " " full, put, or as *oo* in foot, book.
û " " urn, burn.
y " " yet, yield.
B " " Spanish Habana, Córdoba, where it is like English *v* but made with the lips alone.
ch as in chair, cheese.
D " " Spanish Almodovar, pulgada, where it is nearly like *th* in English then.
g " " go, get.
G " " German Landtag = *ch* in Ger. ach, etc.
H " *j* in Spanish Jijona, *g* in Spanish gila; like English *h* in hue, but stronger.
hw " *wh* in which.
K " *ch* in German ich, Albrecht = *g* in German Arensberg, Mecklenburg, etc.
n̲ " in sinker, longer.
ng " " sing, long.
N " " French bon, Bourbon, and *m* in the French Étampes; here it indicates nasalizing of the preceding vowel.
sh " " shine, shut.
th " " thrust, thin.
TH " " then, this.
zh " *z* in azure, and *s* in pleasure.

An apostrophe ['] is sometimes used as in tā'b'l (table), kăz"m (chasm), to indicate the elision of a vowel or its reduction to a mere murmur.

For foreign sounds, the nearest English equivalent is generally used. In any case where a special symbol, as G, H, K, N, is used, those unfamiliar with the foreign sound indicated may substitute the English sound ordinarily indicated by the letter. For a full description of all such sounds, see the article on PRONUNCIATION.

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* Deceased.

THE NEW INTERNATIONAL ENCYCLOPÆDIA

TARTAGLIA, tär-tä'lyȧ, Nicolò (1500–1557). An Italian physicist and arithmetician whose real name was Nicolò Fontana. He was born at Brescia, lectured at Verona, and became professor of mathematics at Venice. Tartaglia first became generally known through his solution of cubic equations, and from his suggestions Cardan (q.v.) probably derived the solution known as Cardan's method. His work in physics is preserved in his *Nuova scienza* (1537; French trans., 1845–46), showing that he studied the theory of falling bodies and investigated the range of projectiles at various angles. His treatise on arithmetic, *General trattato de numeri et misure* (1556–60), is the chief authority on the Italian methods of his time. *Quesiti et inventioni dierse de Nicolò Tartaglia* (1546) is also well known.

TAR'TAK. According to 2 Kings xvii. 31, the name given to a deity worshiped by the Avites, who were transferred to Samaria by the Assyrian King after the destruction of the northern Hebrew Kingdom. Jewish tradition represents Tartak as worshiped under the form of an ass (*Tal. Bab.*, *Sanhedrin* 63). No such deity as Tartak has been found in the Babylonian or Assyrian literature, but it is possible that Tartaḫu is meant, which is a name of Ninib.

TAR'TAN (possibly Fr. *tiretaine*, *tirtaine*, linsey-woolsey, from Sp. *tiritaña*, thin silk or woolen cloth). A well-known cloth of checkered pattern, also called plaid. The Scottish Gaelic tartan is a loan word from the English; the native name is rather breacan. These colored plaids have long been in great favor in the Highlands of Scotland, where each clan has its distinctive pattern. Consult James Grant, *Tartans of the Clans of Scotland* (Edinburgh, 1886), and C. N. North, *Leabhar communnam fior Chael, Book of the Club of True Highlanders* (2 vols., London, 1892).

TAR'TAR (ML. *tartorum*, MGk. *τάρταρον*, tartar, probably from Lat. *Tartarus*, from Gk. *Τάρταρος*, Tartarus, Hades). A mixture of bitartrate of potash and tartrate of lime, deposited from wine and known in its crude form as argol or lees. (See Argol.) In dentistry, a deposit upon the teeth, consisting mostly of calcium phosphate.

TARTAR EMET'IC. A name applied to the double tartrate of potassium and antimony, $K(SbO)C_4H_4O_6 + \frac{1}{2}H_2O$. It is prepared by making a paste of antimonious oxide, acid potassium tartrate and a little water, allowing to stand for several hours, then boiling the paste with water, and allowing the resulting solution to crystallize. Tartar emetic has a sweet taste, but leaves a disagreeable aftertaste in the mouth. It is moderately soluble in water, but is insoluble in alcohol. It has an irritating effect on the alimentary canal, and causes vomiting; but vomiting is also due to its action upon the medulla, after absorption into the blood. Owing chiefly to its depressing effect on the heart and the nervous system, it is now little used.

TARTARIC (tär-tăr'ĭk) **ACID**, $C_4H_6O_6$. An acid compound of carbon, hydrogen, and oxygen, of which four different modifications are known. Ordinary tartaric acid is usually seen in the form of colorless, transparent crystals, which are not affected by the action of the air, have an agreeable acid taste, and are soluble in water and alcohol. The crystals when gently warmed become strongly electric, the opposite sides of the crystals becoming charged with the opposite forms of electricity. On heating tartaric acid to about 169° C. (336° F.), it fuses; and at slightly higher temperatures it becomes changed into metatartaric, tartralic, and tartrelic acids, substances of still unknown constitution.

Tartaric acid occurs abundantly in the vegetable kingdom both free and combined. It is from argol (q.v.), a product of grape-juice fermentation, that the tartaric acid of commerce is obtained. Argol, or crude tartar, is boiled with water and hydrochloric acid, and the solution precipitated with lime. The insoluble tartrate of calcium thus obtained is purified by washing with water, then decomposed by treating with sulphuric acid. This transforms the tartrate into the sparingly soluble calcium sulphate, while tartaric acid goes into solution in the free state. The filtered liquid, when cooled and evaporated, yields crystalline tartaric acid. Tartaric acid is used in the manufacture of baking powders and of certain dyestuffs, in dyeing and calico printing, in photography, and in pharmacy.

Being a dibasic acid, tartaric acid can form both acid and neutral salts. The most important tartrates are the following: Neutral potassium tartrate, $K_2C_4H_4O_6$, a soluble salt which crystallizes with half a molecule of water. Acid potassium tartrate, or bitartrate of potash,

$KHC_4H_4O_6$, is prepared from argol by extraction with boiling water and filtering the solution thus obtained through charcoal. The salt crystallizes readily as the hot solution cools. The snowy white rhombic prisms thus deposited constitute cream of tartar, which is moderately soluble in cold water and less soluble in alcohol. It is an excellent saline purgative and diuretic and is largely used in medicine. Calcium tartrate, $CaC_4H_4O_6 + 4H_2O$, is practically insoluble in cold water and slightly soluble in hot water. The insolubility of the acid tartrate of potassium and of the tartrate of calcium often helps to identify tartaric acid. Tartar emetic is described above.

Tartaric acid was early known in the form of tartar; Scheele was the first to obtain the acid in the free state and to determine its principal properties (1769). Like other acids, tartaric acid promotes secretion of saliva, and may be used to allay thirst. When taken internally it is decomposed in the blood with formation of alkaline carbonates, which cause an increase of the alkalinity of urine.

A remarkable modification of tartaric acid is known as racemic acid $(C_4H_6O_6)_2.2H_2O$. It is a frequent associate of tartaric acid, but is especially abundant in the grapes of the Vosges district. While it exhibits a close resemblance to tartaric acid, it crystallizes more readily from solution; contains two equivalents of water of crystallization; is less soluble in alcohol; and the racemate of lime is soluble in hydrochloric acid, and is precipitated unchanged on adding ammonia. Its most important difference, however, is that its solution does not rotate the plane of polarized light, while a solution of ordinary tartaric acid exerts a well-marked right-handed rotation. Pasteur proved that racemic acid is a combination of ordinary tartaric acid (to which, from its optical property, he applies the term "dextroracemic acid") and of an acid which produces left-handed rotation, to which he gives the name "lævoracemic acid." (These acids are at present generally referred to as dextrotartaric and lævotartaric acids.) He found that, by saturating racemic acid with soda and ammonia, and allowing this solution to crystallize at the temperature of the laboratory, two varieties of crystals are obtained, which differ from one another in the same way as a right-hand glove and a left-hand glove, or as any unsymmetrical object differs from its own mirror image. If the two kinds of crystals are separated, and then dissolved, each solution is found to act powerfully on polarized light, but in opposite directions. On separating the free acid from each of the two solutions, and mixing equal parts of concentrated solutions of these acids, racemic acid is again formed, which exerts no action on a polarized ray.

Besides the three modifications mentioned above, viz., ordinary or dextrotartaric acid, lævotartaric acid, and racemic acid, a fourth modification of the same chemical composition and constitution, known as mesotartaric, antitartaric, or inactive tartaric acid, has been obtained. It may best be prepared by boiling tartaric acid with a strong solution of caustic potash. In the anhydrous state mesotartaric acid melts at about 140° C. (284° F.); usually, however, it is obtained in the form of crystals having the composition $C_4H_6O_6.H_2O$. It is very soluble in water. Its acid potassium salt, too, is very soluble in water, and its calcium salt crystallizes with 3 molecules of water: $CaC_4H_4O_6.3H_2O$. The different modifications of tartaric acid have also been prepared synthetically. Their relation to one another has been explained stereochemically. See Stereochemistry.

TARTARIN, tȧr'tȧ'răN'. The hero of three tales by Alphonse Daudet, *Tartarin of Tarascon* (1872), *Tartarin on the Alps* (1885), and *Port-Tarascon* (1890).

TARTARS, tär'tarz. See Tatars.

TAR'TARUS (Lat., from Gk. Τάρταρος). According to Homer, a deep and sunless abyss, as far below Hades as earth is below heaven, and closed in by iron gates. Into Tartarus Zeus hurled those who rebelled against his authority, e.g., Cronos and the Titans. It is to be noted that such sinners as Tityos, who offered violence to Leto, and after his death by the arrows of Apollo and Artemis was condemned to have his liver perpetually eaten by vultures, or Sisyphus (q.v.), Tantalus (q.v.), and Ixion (q.v.) are represented in the earlier poems as suffering in sight of the other shades. Later, when the idea of a judgment in the other world and a separation between the good and the bad had become well developed, Tartarus became the place of punishment for all sinners.

TAR'TARY (properly *Tatary*). The name which, in the Middle Ages, was applied to the central part of Eurasia. In later times a distinction was made between European and Asiatic Tartary, the former comprising that part of Russia which was once the Khanate of the Crimea. The term Asiatic Tartary, first applied to the whole of Central Asia, has gradually been confined to Turkestan.

TARTE, tärt, Joseph Israel (1848–1909). A Canadian statesman. He was born in the Province of Quebec, was educated at L'Assomption College, and was admitted to the bar in 1871. Afterward he became editor of *Le Canadien* and then of *L'Evénement*, in Quebec. Politically he was a Conservative until 1891, but after that he supported the Liberals. He was a member of the Legislative Assembly of Quebec in 1877–81, and became an active political organizer of his party in that province. As the avowed foe of corruption, he had given dissatisfaction by criticism of certain politicians and measures; but after his election to the Dominion House of Commons in 1891, as an Independent Conservative, he attacked the administration of Sir John A. Macdonald, his political chief, alleging corrupt practices by ministers. This compelled him to leave the Conservative party, and when the Laurier administration came into power in 1896 he was appointed Minister of Public Works. He held that position until 1902. He was afterward political editor of *La Patrie* of Montreal.

TARTINI, tär-tē'nê, Giuseppe (1692–1770). An Italian violinist, composer, and theoretician, born at Pirano, Istria. He discovered the combination tones, about 1714, and used them in making perfect purity of intonation. His fame rapidly increased and in 1721 he was made solo violinist and conductor of the orchestra at Sant' Antonio in Padua. From 1723 to 1725 he was chamber musician to Count Kinsky at Prague. Afterward he again took up his duties at Padua and founded a violin school there in 1728, which acquired a world-wide reputation. His compositions include numerous classical concertos, sonatas, and other compositions for the violin, and the best known of his theoretical works are: *Trattato di musica secondo la vera scienza dell' armonia* (1754); *De' principj dell' armonia musicale contenuta nel diatonico genere* (1767); and *L'arte dell' arco*, reprinted in Choron, *Principes de composition*, vol. vi (Paris, 1816). Consult Fayolle, *Notices sur Corelli, Tartini, etc.* (Paris, 1810).

TARTUFE, tȧr'tụf', or **TARTUFFE**. The name of Molière's most celebrated comedy and of the chief character in it, who has become the type in all languages for a hypocritical scoundrel carrying out his evil designs under the cloak of religion. In the play Tartufe ingratiates himself with a simple-minded gentleman named Orgon, and nearly ruins both him and his family before being discovered. The name is said to have suggested itself to Molière on the occasion of a visit to the Papal Nuncio, where he saw the pious and solemn countenances of the Nuncio's courtiers suddenly lighted up with ecstatic animation by the appearance of a seller of truffles—in Italian, tartuffoli. The play was written in 1664, presented once in 1667, then prohibited, and it was not until 1669 that Molière succeeded finally in getting the King's consent, after which the comedy ran for three months.

TARUDANT, tä'ro͞o-dänt'. The capital of the Province of Sus, Morocco, situated between the base of the Atlas Mountains and the Sus River, 125 miles southwest of Morocco (Map: Africa, D 1). The surrounding country is highly cultivated and the city, walled and defended by a citadel, contains many fine mosques, groves, and gardens. The streets are narrow and crooked and most of the houses have but one story. Copper, gold, silver, and iron ores are mined in the vicinity and the chief industries are the manufacture of copper articles for Central Africa, tanning, leather dressing, and dyeing. Pop. (town), about 8500; (district) 30,000.

TARUMÁ, tä'ro͞o-mä'. A tribe of Arawakan stock (q.v.) on the headwaters of the Essequibo River, British Guiana. They came originally from the Rio Negro, Brazil. They are of medium stature, but well formed. Their language differs so much from the cognate dialects that it was formerly thought to constitute a distinct stock.

TARUMARI, tä'ro͞o-mä'rē, or TARAHUMARI. A numerous tribe of Piman stock (q.v.) occupying the Sierra Madre region of central and southern Chihuahua, and extending into the adjacent sections of Sonora and Sinaloa, Mexico. No reliable statement of their number can be given. On account of the broken character of their country there is no central organization, each valley settlement managing its own affairs under a local chief. The language is in several dialects and the people generally are classed by the Mexicans as Christians in the north and heathen in the south. Although peaceful in character, the Tarumari have several times revolted against the Spaniards and the Mexicans. In 1648 they rose, destroyed all the missions, drove out every Spaniard, and for four years maintained a successful resistance under their chief Teporaca. In 1690 they again rebelled, destroyed the missions, mines, and haciendas, and massacred all the Spaniards, but were finally subjugated in 1692. A local insurrection in the neighborhood of Temosachic, northwest of Chihuahua City, in 1895, led by a native prophetess, was suppressed only after a massacre by Mexicans.

Physically, the Tarumari are dark and rather undersized, but of remarkable strength. They resemble the Pueblo Indians. They make pottery and weave elaborate girdles of native cotton, though the men ordinarily wear only a loin cloth. They are sedentary and semiagricultural, but depend also upon hunting, fishing, and wild products. Much attention is given to the corn crop, nearly all their ceremonial dances being invocations or thanksgiving for rain. They have a feast of the dead a year after the funeral, and are devoted to the peyote rite, going hundreds of miles on foot to procure supplies of the cactus. Their houses are small thatched huts of logs or stones laid in clay mortar, and they frequently utilize the mountain caves for dwelling purposes. Consult K. S. Lumholtz, *Unknown Mexico* (New York, 1902).

TASCHEREAU, tȧsh'rŏ', ELZÉAR ALEXANDRE (1820–98). A Canadian prelate and cardinal, born at Ste. Marie de la Beauce, Quebec. He was educated at the Quebec Seminary, with which, after his ordination to the priesthood in 1842, he remained connected for nearly thirty years, first as professor of moral philosophy and from 1860 as superior, the appointment including the rectorship of Laval University. In 1862 he was made vicar-general of the diocese, and Archbishop in 1871. In 1872 he founded the Hôtel Dieu du Sacré-Cœur at Quebec and restored the church at Ste. Anne de Beaupré. In 1886 he became Cardinal, the first Canadian member of the Sacred College. In 1894 he retired from the administration of his diocese. Consult J. C. Dent, *Canadian Portrait Gallery* (Toronto, 1880), and Henri Têtu, *Le Cardinal Taschereau* (Quebec, 1891).

TASCHEREAU, SIR HENRI ELZEAR (1836–1909). A Canadian jurist. He was born at Ste. Marie de la Beauce, Province of Quebec, and was educated at Quebec Seminary. Called to the bar in 1857 he practiced his profession in Quebec City. He was a Conservative member of the Canada Legislative Assembly in 1861–67, and in 1871 was appointed a judge of the Superior Court of the province. He was a judge of the Supreme Court of Canada in 1878–1902, and Chief Justice thereof in 1902–06, retiring in the latter year. He was a member of the Judicial Committee of the Imperial Privy Council. In 1902 he was knighted. He published: *Notes and Commentaries on the Criminal Law of Canada* (1874); *The Code of Civil Procedure in Lower Canada* (1876); *The Criminal Code of the Dominion of Canada, as Amended in 1893* (1896).

TASCHEREAU, JULES ANTOINE (1801–74). A French author and statesman, born at Tours. He studied law at Orléans and then entered journalism in Paris. He was for a time the editor of the *National;* served in the magistracy; and in 1833 founded the *Revue Rétrospective*, devoted to the collection of documents upon history and literature (20 vols., 1833–37). In 1837 he was elected to the Chamber of Deputies. He sat in the Constituent Assembly, and then in the Legislative Assembly; supported the Empire, and was rewarded with a place in the National Library, of which he in time became director. Among his published works are *Histoire de la vie et des ouvrages de Molière* (1825) and *Histoire de la vie et des ouvrages de P. Corneille* (1829).

TASHKENT, tȧsh-kĕnt', or **TASHKEND**. The capital of the Governor-Generalship of Russian Turkestan and of the Territory of Syr-Darya, as well as one of the most important cities of Central Asia, situated near the Tchirtchik, a feeder of the Syr-Darya, about 150 miles northeast of Samarkand (Map: Asia, H 4). It consists of the new Russian city, built up since the Russian occupation, and the old native city. The former is well laid out, abounds in private gardens, and compares favorably in regard to public buildings and educational institutions with most cities of European Russia. It has a library rich in works on Central Asia. The native city is still partly surrounded by walls and is Oriental in appearance, with its narrow crooked streets and low houses turning towards the street their blind walls. Tashkent manufactures leather goods, textiles, metal articles, and footwear. Agriculture and gardening are carried on. Commercial relations are also maintained with China by way of very ancient caravan roads. The trade has greatly increased in importance since the connection of the city with the Caspian Sea by rail. A large portion of the trade of the upper valleys of the Syr and Amon is centralized at Tashkent. Pop., 1904, 164,749, consisting chiefly of Sarts, Tatars, Kirghizes. The Russians number about 25,000. The first trustworthy mention of Tashkent dates from the seventh century, although local traditions attribute to the city very great antiquity. The town has been in possession of Russia since 1865.

TASIKO. See New Hebrides.

TASK, The. A descriptive and didactic poem in blank verse by William Cowper, written in the summer of 1783 at the suggestion of Lady Austin, who had jestingly proposed a sofa as a possible subject for the poet.

TASK AND BONUS. A policy and system of management developed and introduced into a number of large manufacturing establishments by H. L. Gantt and usually associated with his name. Its principal elements are: (1) Determining the task which a workman suited to the job can be taught to perform readily. Task in this sense means a determined volume of output of standard quality, produced in the way determined to be the best. (2) Providing means of teaching or training the workman to perform this task regularly by the standard movements prescribed. (3) Fixing such payment for the accomplishment of the task as will secure the workman's coöperation and make him satisfied that he is being fairly treated. (4) Maintaining the usual day rate of payment to the workman during the process of training, or during any time when he fails to reach the determined rate of output—or, in other words, to perform the task set for him.

In substance, then, this method maintains the ruling rate of day wages for all employees, but awards in addition a bonus to those who achieve the task. In practice it is found most satisfactory to express this bonus in terms of time to be paid for, rather than directly as wages. Putting it in the form of a percentage of time allowed eliminates from consideration any question of the actual rate per day, which may be fixed by collective bargaining or by any method prevalent in the community. The rate of bonus, or the additional percentage of time allowed for achieving the task, varies with the conditions, but is generally between 25 and 40 per cent. For example, if the time allowed for completing a certain piece or certain volume of work under the task and bonus system is 10 hours, the wage rate is 20 cents an hour and the bonus offered is 25 per cent, the workman completing that piece or turning out that volume of work in 10 hours or less is paid for 12½ hours. He receives $2.50 for the job, regardless of time, if the time taken is within the task limit of 10 hours. The workman attempting the "task," but failing by taking more than 10 hours, is paid only the regular day rate for the actual time he has worked. If this is 11 hours, e.g., he would receive but $2.20.

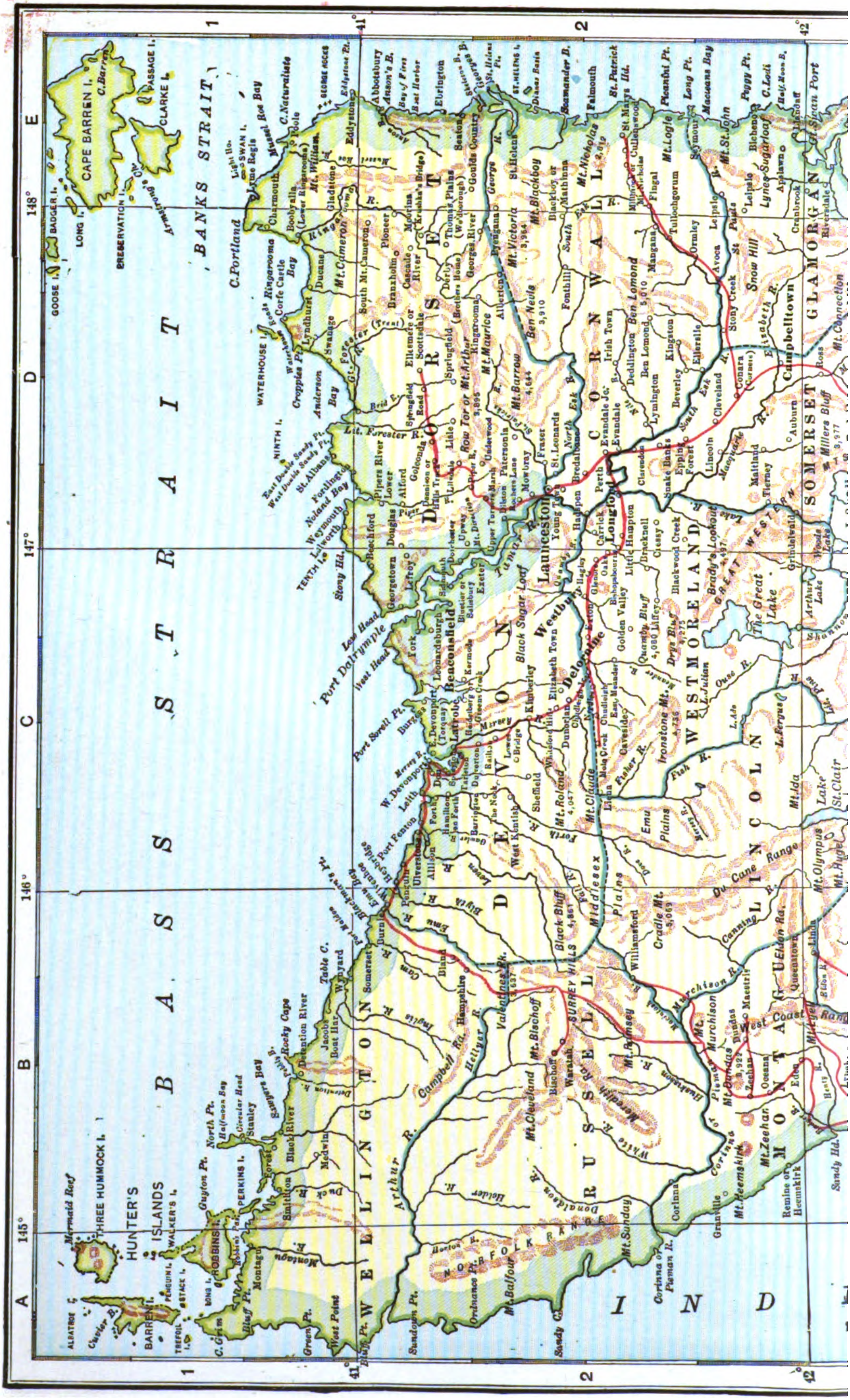
The objects sought are to secure the maximum output consistent with continued health and well-being of the operative, and at the same time to forestall or overcome the objections generally raised by workmen to new methods or new machinery. These spring usually from the fear (too often realized) that hardships will be imposed upon them by the change. The attractiveness of a new job or a new method is offset by the risk that the worker and his family may lose the means of support in the attempt to make the change or to gain higher efficiency. This is true even of the acceptance of piece rates; for with the possibility of larger gain there is also the chance of being able to turn out only a small output and consequently receive only small pay.

As the task and bonus system does not disturb the day rate as a primary basis of payment, the workman runs no risk in attempting to accomplish the task. Therefore if the work has been properly studied, and a properly attainable task has been set, and a proper rate of bonus is offered, the task and bonus method may afford a satisfactory solution for many labor problems. Consult H. L. Gantt, "Task and Bonus," in American Society of Mechanical Engineers, *Transactions* (New York, 1901), and ib., *Work, Wages, and Profits* (2d ed., ib., 1913).

TAS'KER, John Greenwood (1853–). An English Wesleyan Methodist clergyman, born at Skipton and educated at Richmond College. He entered the ministry in 1875, and was elected to the Legal Hundred in 1902. From 1880 to 1884 he spent his time at Stuttgart, Germany. For many years he served as theological tutor in Richmond College and in Handsworth College, Birmingham, and of the latter became principal. Tasker published *Spiritual Religion*, the Fernley Lecture of 1901, and contributed to several important works.

TASMAN, täs'män, Abel Janszoon (c.1602–59). A Dutch explorer. He was born at Lutgegast, near Groningen, and early went to sea. He made two important voyages of discovery in the Pacific. In 1642 he left Batavia in command of an expedition sent out by Van Diemen, Governor-General of the Dutch East India Company, to circumnavigate the Australian continent. During his voyage of ten months he discovered (Nov. 24, 1642) Tasmania—which he called Van Diemen's Land—New Zealand, and the Friendly and Fiji Islands. After publishing an account of his voyage, which was reprinted in 1722 (2d ed. by Jacob Swart, 1860), he made a second voyage in 1644 to New Guinea and New Holland and discovered the Gulf of Carpentaria. His life has been written by Dozy, in his *Bijdragen tot de taal-, land-, en volkenkunde van Nederlansch Indie* (1887), and by Walker (Hobart, 1896).

TASMA'NIA. A state of Australia occupying the island of Tasmania with its neighboring islands. The island of Tasmania, formerly called Van Diemen's Land, lies between lat. 40° 33′ and 43° 39′ S. and long. 144° 39′ and 148° 23′ E. (Map: Australasia, G 7). It is separated from

BASS STRAIT
BANKS STRAIT
HUNTER'S ISLANDS
THREE HUMMOCK I.
ROBBINS I.
CAPE BARREN I.
CLARKE I.
BADGER I.
GOOSE I.
WATERHOUSE I.
WELLINGTON
DEVON
DORSET
CORNWALL
WESTMORELAND
RUSSELL
LINCOLN
MONTAGU
SOMERSET
GLAMORGAN
LONGFORD
Launceston
Beaconsfield
Westbury
Deloraine
Campbelltown
Longford
Port Dalrymple
Tamar R.
Great Lake
Ben Lomond
Mt. Barrow
Ben Nevis
Cradle Mt.
Black Bluff
Mt. Roland
Du Cane Range
West Coast Range
Mt. Zeehan
Mt. Heemskirk
Mt. Bischoff
Surrey Hills
Middlesex Plains
Emu Plains
Table C.
Rocky Cape
Circular Head
Stanley
C. Grim
West Point
Sandy C.
Arthur R.
C. Portland
Lake St. Clair
Mt. Olympus
I N D
145°
146°
147°
148°
41°
42°
A
B
C
D
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1
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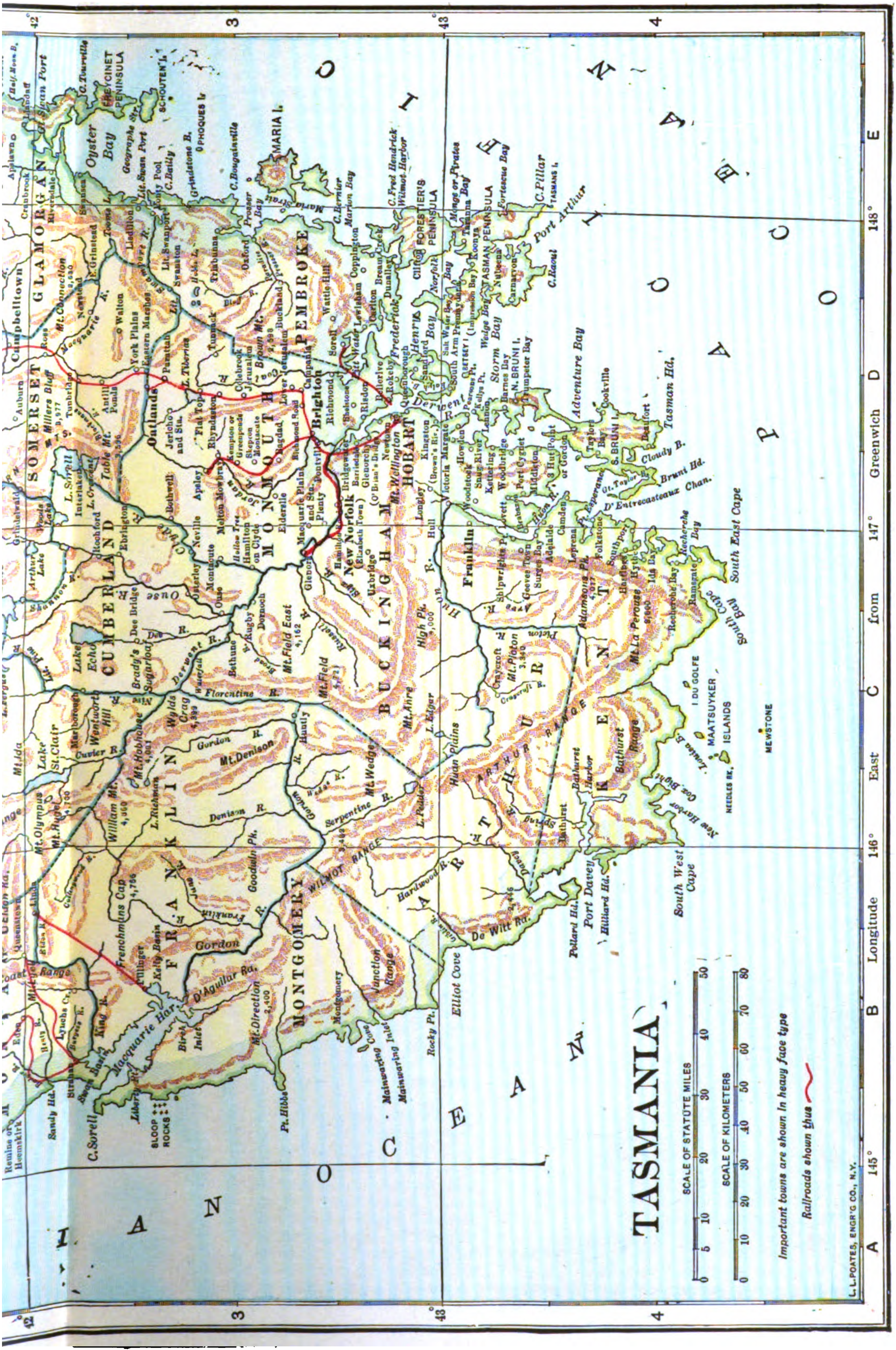
TASMANIA
SCALE OF STATUTE MILES
0 5 10 20 30 40 50
SCALE OF KILOMETERS
0 10 20 30 40 50 60 70 80
Important towns are shown in heavy face type
Railroads shown thus
Longitude East from Greenwich
L.L.POATES, ENGR'G CO., N.Y.
OCEAN
PACIFIC OCEAN
HOBART
CUMBERLAND
FRANKLIN
MONTGOMERY
ARTHUR
KENT
BUCKINGHAM
MONMOUTH
PEMBROKE
GLAMORGAN
SOMERSET
Macquarie Har.
Port Davey
South West Cape
South East Cape
Storm Bay
TASMAN PENINSULA
FORESTIER'S PENINSULA
MARIA I.
Oyster Bay
FREYCINET PENINSULA
S. BRUNI I.
N. BRUNI I.
D'Entrecasteaux Chan.
MAATSUYKER ISLANDS
MEWSTONE

the southeastern portion of the Australian continent, the coast of Victoria, by Bass Strait, 140 miles wide; the Indian Ocean bounds the island on the west and the Pacific on the east, the two meeting at its southern extremity. Tasmania is irregularly heart-shaped, measuring 200 miles from north to south and 245 miles from east to west. The area of the main island is 24,331 square miles, and of the state, including the smaller islands, 26,215 square miles.

Tasmania is an ancient plateau, which has been extensively and irregularly dissected by the action of running water. A bleak table-land, 2000 to 3000 feet high, occupies the middle and a large part of the western half of the island and is crowned by mountains and cleft by chasms through which issue the torrential streams of the west coast. In the northwest this plateau reaches an altitude of 5069 feet in Cradle Mountain, the highest point of the island. In the northeastern corner of the island there is a similar plateau remnant, but between the two there is a series of great valleys extending from the mouth of the Tamar in the north to that of the Derwent in the south and affording the route for the main railroad line. The remaining parts of the island are cut up into a maze of deep valleys and high ridges and peaks, often of a precipitous character. There are about 20 peaks over 4000 feet high scattered through nearly every part of the island. The coasts are generally bold, and in the southeast are irregularly indented with fiords and harbors suggesting, together with the generally lower level of the surrounding mountains and the outlying islets, a subsidence of the land in this direction.

The central area is studded with a number of mountain lakes of considerable size, most of which feed the Derwent River. The rivers of Tasmania are large and numerous considering the size of the island. The most important are the Derwent and Huon in the south, the Gordon in the west, and the Tamar in the north, all of which enter the sea through large, navigable estuaries.

The climate, on account of the westerly winds, is more temperate and equable than that of the continent. At Hobart the mean temperature in summer is 62° F., and in winter 47° F., the extremes ranging to 100° F. and 29° F. The rainfall varies greatly in the different localities, and depends largely on the degree of exposure to the west winds, which bring most of the moisture. In the east the general average is 22 inches, in the north 30 inches, and in the west 40 inches, though some western localities have had 100 inches of rain in a year. In the west and southwest, where the rocks are granitic and schistose, the soil is rather poor. In the central valley and in the northern and southeastern districts the Tertiary deposits have combined with volcanic detritus to form a very rich soil of a chocolate color.

The flora is essentially Australian, and closely related to that of Victoria. The gigantic eucalyptus is widely distributed, and the Huon pine (*Dacrydium franklini*) is common in the south. The Tolasa Blue Gum attains a height of 350 feet. The conifers are well represented, there being 9 species peculiar to the island, and of the 1100 species of angiosperms, or higher plants, over 250 are restricted to Tasmania. The fauna, though also distinctively Australian, includes several mammals unknown on the mainland. The most remarkable of these are two carnivorous marsupials, the Tasmanian wolf and the Tasmanian devil. See DASYURE.

The central table-land and the western and southern portions are built up mainly of Paleozoic strata through which harder igneous rocks have been intruded. Towards the coast Mesozoic and Tertiary formations appear, chiefly as sandstones, while throughout, but especially in the east, there are extensive volcanic outpourings, dikes of porphyry and greenstone, and large fields of basalt of Tertiary age. The latter, capping and protecting the softer sandstones, are largely responsible for the rugged and irregular nature of the surface. Considerable beds of coal and lignite appear in the Paleozoic and Mesozoic formations. Copper near Macquarie Harbor, tin in the northwest, and gold are important minerals, and coal mines and oil shale are worked.

The principal minerals produced are tin, copper, silver, and gold. Formerly copper led in the value of annual output, but it has been surpassed by tin, in the production of which Tasmania exceeds any other Australian state. Both lode and stream tin are worked. The principal tin workings are at Mount Bischoff, in the northwest; the workings at Brauxholm and Mount Cameron, in the northeast, should be mentioned. Copper is found chiefly on the west coast, particularly at Mount Lyell. Silver occurs on both east and west coasts. The principal gold fields are at Beaconsfield, Lefroy, and Mathinna. Up to the end of 1912 the recorded value of Tasmania's mineral output was £36,669,779, of which tin £11,972,602, copper £10,256,981, gold £7,407,282, and silver and lead £6,258,748. In 1912 the output of tin ore amounted to 3713 tons, valued at £543,103; in 1913, 4010 tons, £531,983. The value of the copper output in 1901 was £1,026,748, in 1912, £440,444, and in 1913, £375,664; the output amounted to 9730 tons in 1901 (besides 10,029 tons of ore), 6528 tons in 1912, and 6536 in 1913. The output of silver and lead in 1912 was valued at £309,098 and in 1913 at £319,997. The maximum gold output, £327,545, was reached in 1899; the output in 1912 was valued at £161,300, and in 1913 at £141,876. Other minerals, especially coal, are worked to some extent.

The agricultural development has been less noteworthy than that of the other Australian states. The area under crop in 1880–81 (140,788 acres) was smaller than in 1860–61; in 1912–13 it was 286,065 acres, and, in 1913–14, 264,140 acres. In addition, there were in the latter year 605,559 acres under permanent artificially sown grasses, as compared with 314,422 acres in 1901–02. Wheat cultivation has declined; in 1860–61 the acreage was 66,450; in 1865–66, 73,270; in 1912–13, 25,226. In 1913–14 there were under wheat 18,432 acres, yielding 349,736 bushels; oats, 58,886 acres, 1,598,664 bushels; potatoes, 30,811 acres, 80,389 tons; hay, 84,138 acres, 112,958 tons. Of great importance is the cultivation of fruit, especially apples; to apples 24,370 acres were devoted in 1912–13. Tasmania is well adapted to stock raising, but the industry has not shown much progress in recent years. On March 1, 1914, there were 43,941 horses, 205,743 cattle, 1,745,356 sheep, and 37,990 swine. The estimated wool clip for 1913 was about 8,872,000 pounds.

In the direct oversea trade (exclusive of the trade with other Australian states), imports and exports were valued at £816,886 and £625,031 respectively in 1911, and £1,025,081 and £522,865 in 1913. The exports include tin, wool, silver, gold, timber, fruit, and jam. The principal ports are Hobart and Launceston. In 1914 there were 684 miles of railway, of which 519 miles belonged to the government. The gauge is mainly 3 feet, 6 inches.

The executive authority is vested in a Governor, who is appointed by the British crown and is assisted by a cabinet of five ministers responsible to the legislative body. This body is the Parliament, consisting of the Legislative Council (18 members, elected for six years) and the House of Assembly (30 members, elected for three years). Tasmania is represented by six Senators and five Representatives in the Australian Parliament. There is universal adult suffrage.

The revenue and expenditure in 1912 amounted to £1,111,292 and £1,077,857 respectively; in 1913, £1,238,085 and £1,235,014. Public debt June 30, 1914, £12,265,012; the debt was incurred for the construction of public works.

The estimated population of Tasmania in 1825 was 14,192; in 1850, 68,870; in 1875, 103,739; in 1900, 172,900. The census of March 31, 1901, returned a population of 172,475 (89,624 males, 82,851 females); that of April 3, 1911, 191,211 (97,591 males, 93,620 females). The people are almost wholly of British race; of the total in 1911, 172,497 were born in the Commonwealth of Australia. In 1911 there were 183,840 persons returned as Christian. Members of the Church of England numbered 88,158; Roman Catholics, 28,581; Methodists, 24,975; Presbyterians, 15,735. The population of the local government area of Hobart, the capital, was 27,526 in 1911 (with suburbs, 38,391); Launceston, 24,254. There are no other large towns. Marriages in 1913, 1620; births, 5886; deaths, 2131; arrivals, 45,883; departures, 45,168.

Elementary instruction is compulsory. In 1913 there were 431 public elementary schools, with 33,953 pupils enrolled; 16 superior schools, with an average attendance of about 1485; and 72 other schools (nongovernment), with 4450 pupils. There are two technical, besides three mining, schools. At Hobart is the University of Tasmania; the enrollment in 1913 was only 162.

Ethnology. The aboriginal inhabitants of Tasmania, who are now extinct, were of doubtful racial affinities, having been regarded by different authorities as being variously connected with the Papuan, Melanesian, and Australian races. They were of medium stature (1.66 m.), with broad, prognathous faces, subdolichocephalic skulls (index 76–77), very prominent brow ridges, very flat broad noses, dark skins, and frizzly hair, the last-named feature being the chief difference from the Australians. In culture the Tasmanians were probably even lower than the Australian aborigines. Their stone implements were of paleolithic type; they were as ignorant as the Australians of pottery and the bow and also lacked the Australian boomerang and spear thrower. Crude rafts of bark bound together with grass fibre formed their only means of navigation. The tale of the extermination of the Tasmanians, who never numbered more, perhaps, than five or six thousand, is one of the blackest pages in the history of European colonization. The European settlement began in 1804, and by 1824, when the first census was taken, there were only 340 natives alive. These had dwindled down to four by 1865. The last Tasmanian, a woman named Tinganina, is said to have died in May, 1876.

History. In 1642 the Dutch navigator Abel Janszoon Tasman (q.v.) discovered the island now known by his name, supposing it to be the mainland of the southern continent, and called it Van Diemen's Land, in honor of his friend and patron, Anthony Van Diemen, Governor of the Dutch East Indies. It was visited by Captain Cook in 1777. The next recorded exploration is that of George Bass, a young English surgeon, who explored the strait which bears his name in 1798, and thus discovered that Tasmania was not a peninsula, but an island. Later in the year he returned and surveyed the entire coast. No colonizing was attempted until 1803. In that year Captain Collins brought out 400 convicts from England, and in 1804 laid out Hobart Town, the present capital of Tasmania. In the same year a settlement was founded in the northern part of the island by colonists from Sydney. In 1806 this colony was transferred to Launceston. From these two centres the colonization of the island proceeded steadily. Till 1823 the island was under the authority of the New South Wales government. In that year it received a separate Lieutenant Governor and in 1825 a separate Governor. The opposition to convict labor, always deep-seated, notwithstanding the scarcity of laborers, led, in 1835, to the first petition to the home government for its abolition. This, however, did not take place until 1853. In that year, too, the colony received its present name of Tasmania. In 1854 a constitution providing for responsible government by a Colonial Parliament was framed by the Legislative Council of the Colony, in accordance with the terms of the Australian Government Act of 1850, and this bill received the royal assent in 1855. On Jan. 1, 1901, Tasmania became a member of the Commonwealth of Australia. See AUSTRALIA.

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TASMA'NIAN WOLF, TIGER WOLF, ZEBRA WOLF, or THYLACINE. A wolflike, carnivorous, and savage marsupial of Tasmania. See DASYURE; Colored Plate of MARSUPIALS; Plate of PHALANGERS.

TAS'MAN SEA. That portion of the South Pacific Ocean which is included between Australia and Tasmania on the west and New Zealand on the east (Map: Australasia, H, J 6). It is more than 15,000 feet deep and contains but few islands.

TASSAERT, tȧ'särt, ANTOINE (1729–88). A Flemish sculptor, born and trained in Antwerp. After working in London and Paris, where he studied under Slodtz, he was called to Berlin in 1775 by Frederick the Great, who made him court sculptor and rector of the Academy. He modeled many statues and groups in the academic French style; busts including that of Moses Mendelssohn (National Gallery, Berlin), and the statues of generals Seydlitz and Keith, now in the Cadet School at Gross-Lichterfelde, where for the first time great generals are portrayed in their uniform instead of in Roman costume.

TASSAERT, NICOLAS FRANÇOIS OCTAVE (1800–74). A Flemish historical and genre painter. He was born in Paris, and studied at the Ecole des Beaux-Arts and under Girard and Guillon Lethière. He was one of the first realists and portrayed, with able technique, the sufferings of the poor and the unfortunate. His exaggerated pathos does not appeal to present taste, but he was highly regarded by Delacroix and the Barbizon masters. Among his most characteristic works are "The Suicide" and the "Unhappy Family." He also painted historical and religious compositions. Tassaert asphyxiated himself with the fumes of charcoal.

TAS′SIE, JAMES (1735–99). A Scottish modeler and gem engraver. He was born near Glasgow, and studied modeling at the Academy in Glasgow. In 1763 he went to Dublin, where he entered the laboratory of Henry Quin. Together they invented a kind of vitreous paste, or enamel of much hardness and beauty of texture, in which they reproduced gems and medallions. In 1766 Tassie settled in London, where he continued his work with gems and casts, and also made many large white enamel profile medallion portraits of notable contemporaries, among them Adam Smith, Sir Henry Raeburn, and Dr. James Beattie. He made reproductions of some of the most valuable collections of gems in Europe, and executed copies of about 15,000 examples for the Empress Catharine of Russia. He also furnished numerous casts for Wedgwood's (q.v.) work. From 1769 to 1791 he exhibited at the Royal Academy, and a large catalogue of his works, with descriptions by Rudolphe Eric Raspe, was published in the latter year. His nephew, WILLIAM TASSIE (1777–1860), also a gem modeler and caster, succeeded to his uncle's business and added greatly to the collection. A large part of it, bequeathed to the Board of Manufacturers, Edinburgh, is now in the Scottish National Portrait Gallery.

TASSO, täs′sō, BERNARDO (1493–1569). An Italian poet, born in Alenno (Bergamo) and educated at Padua. The early part of his life was spent in the service of the Sanseverino and Rangone families, for whom he visited Tunis, Spain, France, and Flanders. From 1563 he was engaged with Guglielmo Gonzaga, Duke of Mantua, who made him Governor of Ostiglia in 1567. His romanzesque epos *L'Amadigi di Gaula* (1542–60), based on the Spanish prose version of *Amadis of Gaul* by Ordóñez de Montalvo, attempts to reconcile the fantastic freedom of Ariosto with the theory of classic imitation. An episode of this poem he treated afterward separately in *Il Floridante,* completed by his son Torquato in 1587. The lyrics, *Amori* (1555) and *Rime, odi e salmi* (1560), as also his *selve* and *favole* have an historical interest as specimens of imitations (especially of Horace) and from their relations with the Petrarchistic movement. His *Lettere* (Padua, 1733–51) are a valuable contribution to the political and literary history of his time. Consult: Pasolini, *I genitori di T. Tasso* (Rome, 1895); Foffano, *L'Amadigi di B. T.* (Turin, 1896); F. Pintor, *Delle liriche di B. Tasso* (Pisa, 1899).

TASSO, TORQUATO (1544–95). The great Italian epic poet of the Catholic reaction, son of the preceding, born at Sorrento, March 11, 1544. His earliest training was in the Jesuit schools of Naples. On his father's exile in 1552 Torquato went to live in Rome (1552–56), then to Bergamo (1556–57) and Urbino, where Bernardo had taken service (1557–58). In the spring of 1559 he settled in Venice, entering the law school at Padua the following year. From this time date his earliest sonnets and madrigals. Encouraged by their success and under his father's critical guidance he now also began his *Rinaldo,* a poem of Carolingian chivalric substance treated in the manner of Ariosto (a fabric of episodes), but with reference to Aristotelian principles of unity of action (all episodes involving Rinaldo). In 1561 Tasso changed his course at Padua to the school of philosophy and letters. The *Rinaldo* was published in 1562. During these years was being formed the European alliance against Turkey that was to lead to the battle of Lepanto. In the midst of this crusading propaganda (1561–62) Tasso wrote *Del Gerusalemme,* 116 octave stanzas, many of which were later transferred bodily to his immortal masterpiece. For his third semester in philosophy Tasso went to Bologna (1563). Accused of writing a libellous pasquinade against notables of the university, he was compelled (1564) to flee for his life. At his refuge in Modena he received a warm offer of hospitality from the future Cardinal and Patriarch of Jerusalem, Scipione Gonzaga, residing at Padua. Tasso there resumed his studies, composing meanwhile occasional and amorous lyrics for Gonzaga's Accademia degli Eritrei. He graduated in 1565, and received an appointment with Cardinal Luigi d'Este, assuming residence for his sinecure at Ferrara in October of that year. He was destined to remain there for a long period. He made occasional excursions to Mantua to visit his father and his sweetheart Laura Perperara; to Pesaro, Urbino, and Casteldurante as guest of his patroness Lucrezia Gonzaga della Rovere. In 1570 a journey to Paris with the Cardinal brought him in contact with the poets of the French Pleiade, notably Ronsard. Meanwhile Tasso had participated with growing prestige in the Academy life of Ferrara, writing verses and exercises of eloquence and erudition.

In 1572 he was transferred to the suite of Alfonzo II Gonzaga, and the years 1572–74 mark the height of his social popularity. For a festival at Belvedere in 1573 he composed his elegant pastoral drama *Aminta,* a poem in free blank verse. This poem is suffused with a brilliant coloring of extraordinary mellowness. It has a sustained motivation of intense but languid sensuousness, through which runs a vein of the subtle humor inherent in sophisticated courtliness when applied to a pastoral subject. In 1574 Tasso became lecturer in astronomy and mathematics at the university of Ferrara and began a classic tragedy, *Galealto di Norvegia.* As early as 1570 he had resumed work on the subject treated in *Del Gerusalemme;* profoundly affected by current debates on æsthetics, he had been studying carefully the principles underlying epic compositions. His conclusions he embodied in three *Discorsi dell arte poetica,* which remain the best comment on the structure and intent of the *Gerusalemme liberata,* and a typical expression of Aristotelian æsthetics of the Renaissance. The great poem was complete in 1575, a date which also marks the first signs of Tasso's loss of mental balance. He came to betray a certain unexplainable terror for possible criticism of his work. These fears first concerned mere questions of form. He intrusted a private revision of the poem to his friend Scipione Gonzaga, who in turn consulted the celebrated critics Pier Angelio da Barga, Sperone Speroni, Flaminio dei Nobili, and Silvio Antoniano, and they set about the task with all the conscientiousness of pedants. Tasso's *Lettere* record the painful travails of his spirit during these discussions, which aroused in him also a fear lest his poem be in part heretical. The assurances of the Inquisition could not allay this dread. By 1576 he had decided completely to rewrite and allegorize his work, a revision prevented only by his complete nervous breakdown. He began to fancy the existence of plots against him at Ferrara and felt the ground at Florence and Rome as possible harbors of refuge. He quarreled with a certain Ercole Fucci, who finally assaulted him with a cane. In 1577, during an audience with his patroness Lucretia, he drew a knife on a servant who he feared was spying on him. This access led to careful surveillance and medical attention. From this time begin periods of mad flights and wanderings. In July of 1577 he tramped, begging his way as far as Sorrento, but returned apparently normal to Ferrara in April, 1578. In July again he went wandering to Mantua, thence to Padua and Venice, finally ending at Turin. Again in Ferrara, 1579, he became violent at the fancied coldness of his reception, and was confined in the insane asylum of Sant' Anna.

His confinement lasted till 1586, but in frequent lucid intervals he displayed a considerable literary activity. Then, at the instance of Angelo Grillo and Antonio Costantini, Tasso was permitted to accompany Vincenzo Gonzaga to Mantua. A renewed attack of melancholia was not relieved by a vacation in Bergamo (1587), and again Tasso fled, this time to Bologna, the Loreto shrine, whence finally to Rome. The persistent efforts of the Gonzaga to extradite Tasso have caused much discussion as to the presence of other motives than insanity in the poet's long imprisonment. At Rome Tasso was the guest of his old friend Scipione Gonzaga and later of the Aldobrandini. During the six following years he wrote or completed the tragedy *Il Torrismondo* (imitation of *Oedipus Rex*), the *Galealto*, the religious epic *Il mondo creato*, and the revised *Jerusalem Delivered* (which he now entitled *La Gerusalemme conquistata*).

In 1592 came a brief residence with Matteo di Capua and G. B. Manso in Naples. In 1594 Clement VIII assigned him a pension and looked favorably upon the idea of a poetic coronation. Before this scheme was carried out, however, the poet died, April 25, 1595.

The poem of Tasso deals with the taking of Jerusalem during the Third Crusade, largely as described by Gillaume de Tyre. This is the unifying theme, around which is an accretion of episode—the love stories of Rinaldo and Armida, of Tancred and Clorinda, of Erminia and Tancred, of Olindo and Sofronia. This romanzesque element comes to constitute the most important part of the poem; for while the treatment of the main theme falls cold in a matter-of-fact narrative adorned in vain by some extrinsic devices of style, Tasso gives in his episodes free play to his elegiac and idyllic sentiment. The best that can be said for the work as a whole is that the conception of God's power sustaining the faithful man in his weakness to a great accomplishment, is objectified with a greater dignity and a greater freedom from banality than is apparent in any of the epic poems written on the theory that art is a branch of logical science. There is much that is dead in the *Jerusalem Delivered*. It is the episodic figures that live: Sofronia, wholly sane and conscious, but divinely possessed by the rapture of faith; Clorinda, her soul miraculously warmed with Christian charity, bidding an eternal farewell to her lover; the suffocating emotion of Erminia as she sees Tancred's distant camp in the moonlight; Armida's sensuous charm. The *Jerusalem Delivered* shows religious moods more deeply experienced than in any other religious poetry since the time of Dante; and it strikes here and there richer chords of melancholy and pathos than in any other Italian lyrics since Petrarch.

In the *Aminta* and *Jerusalem Delivered* we find nearly all the motives of the Italian verse of the next two centuries. Tasso may be considered thus, as also in matters of form, a great renovator of Petrarchism. His work gave great impetus to the development of *Seicentismo* (see ITALIAN LITERATURE), and he overshadowed both Petrarch and Dante in the minds of the baroque poets of the next five generations: this because, in theory and practice, he considered style as ornamentation, and ingeniosity of metaphor the chief instrument of literary art.

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TASSONI, tȧ-sō′nē, ALESSANDRO (1565–1635). An Italian diplomat, critic, and poet. He was born in Modena of an old patrician family. About 1595 he published at Rome a dialogue in defense of Alessandro Magno and Obizzo d' Este, an effort which was dedicated to Cardinal Alessandro d' Este, and which attracted such favorable notice from that prelate that young Tassoni was taken into the service of Cardinal Ascanio Colonna (1597). His *Considerazioni sopra le rime del Petrarca* (1609) became the occasion of bitter controversy. In 1613 Tassoni entered the service of Charles Emmanuel of Savoy. But his *Filippiche contra gli Spagnuoli* (1615; reprinted 1855) incurred the displeasure of Cardinal Prince Filiberto of Savoy, and Tassoni withdrew into private life (1622). Afterward he became secretary to Cardinal Ludovisi, and then councilor and chamberlain at the court of Duke Francis I of Modena (1632). The *Pensieri diversi* of Tassoni form a curious monument of Seicento culture, but the poet achieved his greatest fame with *La secchia rapita* (The Rape of the Bucket, written 1614; published in Paris, 1622; ed. by Carducci, 1861, etc.). This is a mock heroic poem in 12 cantos, founded upon an incident of the Modenese wars. It is a precursor of Boileau's *Lutrin* (1673) and Pope's *Rape of the Lock* (1712). Its humor, the Tuscan purity of its language, and the perfection of its metrics have made it an Italian classic. Consult: Nunziante, *Alessandro Tassoni, e il Seicento* (Milan, 1885); Bacci, *Le considerazioni sul Petrarca di Alessandro Tassoni* (Florence, 1887); ed. of *Secchia*, *Oceano*, and *Rime* by Casini (ib., 1887); Ambrosi, *Sopra i Pensieri diversi di Alessandro Tassoni* (Rome, 1896); *Le lettere di Alessandro Tassoni*, ed. by G. Rossi (Bologna, 1901); the important *Miscellanea tassoniana*, ed. by Casini-Santi (Modena, 1908); G. Rossi, *Saggio di una bibliografia delle opere di Alessandro Tassoni* (Bologna, 1908).

TASSY, JOSEPH HÉLIDORE SAGESSE VERTU GARCIN DE. See GARCIN DE TASSY, J. H. S. V.

TASTE (OF. *taster*, Fr. *tâter*, to taste, from Lat. **taxitare*, frequentative of *taxare*, to touch, intensive of *tangere*, to touch; connected with Goth. *tĕkan*, Icel. *taka*, AS. *tacan*, Eng. *take*). The sensations of taste are four in number: salt, sweet, sour, and bitter. The varied experiences commonly regarded as tastes are, therefore, blends or fusions of one or more taste qualities with other sensations. Lemonade, e.g., is blended of sour and sweet, cold, pressure, and the odor of lemons. If the nostrils are plugged with cotton wool, claret cannot be distinguished from vinegar or a morsel of raw potato from apple.

Taste is a chemical sense, and like vision and smell, though in a less marked degree, shows the phenomena of mixture, adaptation, and contrast. In mixture, there is at least a partial compensation for all pairs except sweet-salt, if the components are mixed in the proper proportions and at low intensities. Sweet and salt themselves mix to a flat or vapid quality, somewhat as blue and yellow mix to give a gray. Complete adaptation can be attained only by stimulation for several hours with strong solutions; but experiment bears out the common experience that any one of the four qualities is weakened after a stimulation of a few moments. Contrast is both simultaneous and successive. The contrasting pairs are sweet-salt, sweet-sour, and salt-sour; bitter does not contrast with any other taste. The stimulation of the tongue by the one member of these pairs increases its sensitivity to the other member, or causes distilled water to give the contrasting taste.

The tongue, like the skin, is supplied with nerve endings which mediate sensations of pressure, temperature, and pain. The nerve endings concerned in gustatory sensation are the taste bulbs or beakers, many of which are clustered together in the sides of the circumvallate and fungiform papillæ. The central area of the tongue is insensitive to taste; the tip is most sensitive to sweet, the base to bitter, and the edges to sour. This does not mean, however, that all the papillæ in a given region will respond in the same way to gustatory stimuli. As a matter of fact, some respond to four solutions (usually sugar, quinine, tartaric or hydrochloric acid, and salt), others to but three, still others to two, and a few to one alone. We are led to suppose, therefore, that there are four kinds of taste cells, each one responsive to a single mode of stimulus, and that a given papilla may contain all four, or three, or two, or only one. Consult: W. Nagel, *Handbuch der Physiologie des Menschen*, vol. iii (Brunswick, 1905); Oswald Külpe, *Outlines of Psychology;* Eng. trans. by E. B. Titchener (new ed., London, 1909); E. B. Titchener, *Text-Book of Psychology* (New York, 1910); W. M. Wundt, *Physiologische Psychologie*, vol. ii (6th ed., Leipzig, 1910); Ladd and Woodworth, *Elements of Physiological Psychology* (New York, 1911). See PSYCHOLOGICAL APPARATUS. For taste in animals, see CHEMICAL SENSE IN ANIMALS.

TATAR BAZARJIK, tȧ-tär′ bä′zȧr-jēk′, or PAZARJIK. A district town in east Rumelia, Bulgaria, situated on the Maritza, 74 miles southeast of Sofia (Map: Balkan Peninsula, E 3). It lies in a low region and suffers from inundations. Pop., 1905, 17,597, mainly Bulgarians. The place was founded by Tatars in the fifteenth century.

TATARS, tä′tarz (less correctly *Tartars*, Fr. *Tartare*, from ML. *Tartarus*, from Pers. *Tātar*, Chin. *Tahtar*, *Tah-dzŭ*, Tatar, possibly from a Tungusic or Manchu word meaning archer, nomad; probably confused by popular etymology with Lat. *Tartarus*, hell, on account of their atrocities). A term loosely applied to certain Tungusic tribes originally inhabiting Manchuria and Mongolia, and now represented by the Fishshin Tatars of northern Manchuria, the Solons and Daurians of northeastern Mongolia, and the Manchus of China. In the course of the westward movement of the Mongols the term Tatar obtained vogue among the civilized peoples of western Asia and eastern Europe, and came to be applied with little discrimination to the hordes of Mongols who descended from time to time upon the frontiers of Occidental civilization and to the kindred peoples subdued by them. Ultimately it came to be used almost, if not quite, as a synonym for Turkish (Türki), in which sense it is still employed by some modern ethnologists.

The "Tatars of Siberia" (Baraba, Irtish, Tobol, etc.) are probably of very mixed origin. In western Siberia some fragments of the Ostiaks, etc., have been styled Tatars, probably from their adoption of Tatar customs, etc. The Tatars of European Russia are of diverse origins. The so-called Kazan and Astrakhan Tatars are fragments of the Golden Horde. The Tatars of the Crimea are probably composed of the Nogai-Tatars of the steppes and the Tatars of the mountains and coast regions. There are besides the Tatars of the Caucasus. It will easily be seen that most of these peoples styled

Tatars are, linguistically at least, of Turkic stock, but very mixed physically. Consult: Otto Wolff, *Geschichte der Mongolen oder Tartaren* (Breslau, 1872); H. H. Howorth, *History of the Mongols* (London, 1876–80); Hermann Vámbéry, *Etymologisches Wörterbuch der turko-tatarischen Sprachen* (Leipzig, 1878); id., *Die primitive Cultur des turko-tatarischen Volkes* (ib., 1879); Emile Chantre, *Recherches anthropologiques dans le Caucase* (5 vols., Paris, 1885–87); Charles de Harlez, *La religion nationale des Tartares orientaux* (Brussels, 1887).

TATE, Sir Henry (1819–99). An English manufacturer and art patron. He was born at Chorley, Lancashire; entered early on a commercial career in Liverpool, and in 1874 went to London, where he acquired a large fortune in sugar refining. He was the principal founder of Liverpool University College. His chief claim to distinction, however, is as founder of the National Gallery of British Art, popularly known as the Tate Gallery, on the Thames Embankment, near Vauxhall Bridge. This originated in his private collection of modern British pictures. His desire to have this collection preserved prompted his offer of £84,000 for a building purely devoted to British art, if the government would provide the site. The building was completed and opened in 1897.

TATE, Nahum (1652–1715). An English poetaster, born in Dublin. He graduated at Trinity College, Dublin, in 1672, and five years later he was settled in London. In 1692 he succeeded Shadwell as poet laureate. With the exception of Pye (q.v.), he was the tamest of the laureates. He passed his last days in the Mint in Southwark, then a privileged sanctuary for debtors. Tate composed several plays and much poor verse, including elegies and birthday odes. His best poem, composed independently, is *Panacea, a Poem on Tea* (1700). With some success he wrote a second part to Dryden's *Absalom and Achitophel* (1682). The best passages, however, were by Dryden. In literary history Tate has gained unenvied fame as an adapter of several plays by Shakespeare and other Elizabethans. Among them are *Richard II* (1681), *King Lear* (1681), and *Coriolanus* (1682). His version of *Lear,* in which Cordelia survives and marries Edgar, held the stage till 1840. Tate is also known as the joint author, with Nicholas Brady, of the *New Version of the Psalms* (1696; supplement 1698). To Tate is ascribed the beautiful Christmas hymn "While Shepherds Watched." Consult L. F. Benson, *The English Hymn: Its Development and Use in Worship* (New York, 1915).

TATE, Ralph (1840–92). An English geologist and paleontologist, born at Alnwick. He studied at the Royal School of Mines, and in 1861 entered the Philosophical Institution of Belfast as a teacher of natural sciences. In 1867 he joined an expedition for the exploration of Nicaragua and Venezuela; and upon his return to England published a series of papers on the geology and paleontology of those countries. Appointed professor of natural sciences in the University of Adelaide, South Australia, in 1875, he passed the remainder of his life in that country, where he was active in scientific research and helped to establish the Royal Society of South Australia. The list of his publications includes several hundred papers and monographs, among them *Flora Belfastinensis* (1863); *New Yorkshire Lias* (1876); *Handbook of the Flora of Extra-tropical South Australia* (1890).

TATIAN, tā'shan. A Christian apologist of the second century. He was a native of Assyria, received a Greek education, and came to Rome in the time of Justin Martyr, with whom he was intimately associated, probably about the year 152. Under the instruction of this first Christian philosopher, Tatian early became a Christian, and wrote thereupon his first important work, *The Address to the Greeks.* After Justin's death he turned towards views which caused him to be identified with the Gnostics, although comparison of the different accounts leads to the suspicion that party spirit may have exaggerated his departure from the commonly received Christian doctrines and practices. Tatian returned to Mesopotamia, where he was welcomed heartily and performed valuable services for the Church. He prepared here a harmony of the Gospels in Syriac, under the name of *Diatessaron,* or *The Fourfold Gospel,* which early attained a wide circulation among the Syriac-speaking churches, and was made the subject of a commentary by Ephraem Syrus. The Syriac original cannot have been prepared long after Justin's death (about 166), and therefore gives important testimony to the general acceptance of the Fourth Gospel at that time, and hence to its considerably earlier origin. The *Diatessaron* has accordingly been an object of great interest, but the text has been until recently regarded as hopelessly lost. In 1883 a description of an Arabic translation of the *Diatessaron* existing in the Vatican Library, previously but imperfectly described by others, was put forth by Ciasca, a "scriptor" in that library, and in 1888 he published an edition of the text with a Latin translation. A second manuscript of the same translation had meantime been presented to the library (1886). This Latin version has been translated into English by Hill (Edinburgh, 1894; 2d ed., 1910), and an English translation from the Arabic has been made by Hogg in the *Ante-Nicene Fathers,* vol. ix (New York, 1896). Consult: Zahn, *Forschungen zur Geschichte des neutestamentliche Kanons,* vol. iv (Erlangen, 1891); Harris, *The Diatessaron of Tatian* (London, 1890); id., *Fragments of the Commentary of Ephrem Syrus on the Diatessaron* (ib., 1895); A. Hobson, *The Diatessaron of Tatian and the Synoptic Problem* (Chicago, 1904). Both the extant works of Tatian may be found in translation in the *Ante-Nicene Fathers,* vols. ii and iv (New York, 1885 et seq.).

TATISHTCHEV, tä'tĭsh-chĕf, Vassili Nikititch (1686–1750). A Russian historian of the school of Peter the Great (q.v.). He studied at Moscow and in Germany. Tatishtchev participated in the war with Sweden, after which he went on embassies to Poland, Holland, Germany, and Switzerland. Subsequently he was made Governor of Astrakhan and superintendent of mines in the Ural region. Tatishtchev pleaded for the advancement of learning, especially in his *Dialogue on the Benefit of the Sciences,* written in 1733 and first published only in 1887, and wrote a good *History of Russia,* and a didactic treatise, *Testamentary Injunctions* (1773; new ed., 1885), addressed to his son.

TATIUS, tā'shĭ-ŭs, Achilles. A Greek writer. See Achilles Tatius.

TATLER, The. A penny paper published in London by Sir Richard Steele, issued three times a week and running through 271 numbers, between April 12, 1709, and Jan. 2, 1711. Its original purpose was merely to describe events of the day; but with the contributions of Addison, which began in number 18, it gradually assumed a more didactic tone and eventually became a set of essays on various social and quasi-political topics. Its sudden withdrawal was probably occasioned by the exception taken by Steele's superiors in government offices to certain statements printed in it and the editor's consequent dismissal from the gazetteership. His pseudonym of Bickerstaff had also by this time been penetrated. Steele wrote 188 of the papers and Addison 41. The remainder were mostly written in collaboration. The successor of the *Tatler* was the *Spectator* (q.v.).

TATLOCK, John Strong Perry (1876–). An American English scholar, born at Stamford, Conn., and educated at Harvard (A.B., 1896; Ph.D., 1903). He taught at the University of Michigan from 1897, becoming professor of English in 1913. He edited Shakespeare's *Troilus and Cressida* (1912), and with Percy MacKaye, made a version of Chaucer called *The Modern Reader's Chaucer* (1912); and published also *Development and Chronology of Chaucer's Works* (1907); *Harleian MS. 7334, and Revision of Canterbury Tales* (1909); *The Scene of the Franklin's Tale Visited* (1914).

TÁTRAFÜRED, tä'trȧ-fụ'rĕd (Ger. *Schmeks*). A noted Hungarian watering place and health resort in the county of Zips, situated in the midst of pine forests on the south slope of the Hobe Tátra, at the foot of the Schlagendorf peak at an elevation of 3340 feet above the sea. It has mineral springs, pine-cone baths, and a cold-water cure. Near by are the health resorts of Uj Tátrafüred (Neuschmeks) and Alsó Tátrafüred (Lower Schmeks).

TÁTRA (tä'trŏ) **MOUNTAINS.** See Carpathian Mountains.

TATS, täts, or **TATES.** An agricultural people of extreme western Persia and the Caspian region of the Caucasus. Although they may possess some Mongolian blood, they are not Tatars either somatically or linguistically. Some authorities class them with the Persian Tajiks (q.v.). Their number approximates 100,000. Their language is a dialect of Persian.

TA TS'ING, tä'tsĭng' (or Ch'ing). The dynasty on the throne of China at the opening of the twentieth century. It was of Manchu origin and began with the year 1644. The name—*Ts'ing*—means "pure" or "purity," and is said to be synonymous with the word *Manchu*. *Ta* means "great" and was prefixed to almost all dynastic names. It is to be remembered that the personal name of a Chinese emperor was never used during his lifetime. When he came to the throne a name for the period of years during which he reigned was chosen; but it is convenient at times to transfer this name to the man himself; hence we sometimes speak of the Emperor K'ang-hi, or the Emperor K'ien-lung, though strictly speaking these names denote only certain periods of years. The dynasty came to an end Feb. 12, 1912, when the child Hsüan-tung abdicated in favor of the Republic.

THE REIGN PERIODS OF THE TA TS'ING CH'AO OR "GREAT PURE" DYNASTY OF CHINA

NAME OF REIGN	Began	Ended
1. Shun-chih	1644	1661
2. K'ang-hi or K'ang-hsi	1662	1722
3. Yung-ching or Yung-chêng	1723	1735
4. K'ien-lung or Ch'ien-lung	1736	1795
5. K'ia-k'ing or Chia-ch'ing	1796	1820
6. Tao-kwang	1821	1850
7. Hien-fung or Hsien-fêng	1851	1861
8. T'ung-chih	1862	1874
9. Kwang-sü or Kwang-hsü	1875	1908
10. Hsüan-tung	1909	1912

TAT'TAM, Henry (1789–1868). A distinguished Coptic scholar. He was born in Ireland and was educated at Trinity College, Dublin, and at Göttingen and Leyden; he was ordained in the Church of England; and was rector of St. Cuthbert's, Bedford, 1818–45; archdeacon of Bedford, 1844–66; and rector of Stamford Rivers, Essex, 1849 till his death. He traveled in the East and became distinguished as an Orientalist, in which department he published various works. Among the ancient Syriac manuscripts which he found at a convent in Egypt were the *Ecclesiastical History* of John, Bishop of Ephesus, and the *Epistles of Ignatius*. He published a Coptic grammar (1830; 2d ed., 1863), and a dictionary (1835), besides versions of the prophets (1836–52) and of the *Apostolical Constitutions* (1849) in that language.

TAT'TERSALL'S. A famous English market for riding and carriage horses, at Knightsbridge, London; established in 1766 at Hyde Park Corner by Richard Tattersall, a groom to the Duke of Kingston. It consists of a large and handsome building in the centre of which is a large court under a glass roof. At one time it was the centre of all business relating to horse-racing and betting throughout the country.

TATTI, Giacopo. See Sansovino, Jacopo.

TATT'NALL, Josiah (1795–1871). An American naval officer, born at Bonaventure, near Savannah, Ga. He was educated in England, and entered the United States navy in 1812. He served with Decatur in the Algerine War and became a lieutenant in 1818. In the Mexican War, he fought at the capture of Vera Cruz, and led the attack upon the forts at Tuxpan, where he was wounded. In 1850 he became a captain, and in 1857 flag officer on the Asiatic station. In 1859, while on this station, he chartered the small river steamer *Toeywan* to take the American Minister to Peking in order to ratify a treaty negotiated in the preceding year. When the American squadron arrived off the Peiho, Tattnall found there the French and British naval forces with their diplomatic representatives on board. The Chinese having refused permission for any foreign vessels to proceed, the British and French forces attacked the forts. Seeing that they were being worsted, and that the boats containing reënforcements could not stem the strong current of the stream, Tattnall, in the *Toeywan*, declaring that "blood is thicker than water," towed the flotilla up to the support of the badly pressed vessels. The phrase has become historic.

On the outbreak of the Civil War in 1861, Tattnall resigned and became captain in the Confederate navy, charged with the defense of Georgia and South Carolina. In March, 1862, he was given command of the *Merrimac* (*Virginia*) and the defenses of Virginia; destroyed this vessel in order to escape capture; was later court-martialed, but acquitted; was unsuccessful in his defense of Savannah, and in January, 1865, was obliged to destroy his fleet. He was included in Johnston's surrender to Sherman, was paroled, and in 1866 removed with his family to Halifax, but returned in 1870 and was inspector of the port of Savannah until his death. Consult C. C. Jones, *Life and Services of Commodore Josiah Tattnall* (Savannah, 1878).

TATTOO′ING (from *tattoo*, Tahitian *tatu*, tattooing, tattooed). The practice of decorating the surface of the body by introducing pigments under the skin. The process consists in pricking the skin with a sharp instrument and inserting the pigments, usually powdered charcoal, in the punctures. The design appears in a deep blue color and is indelible. Other pigments have come into use in recent times. As a primitive mode of ornamentation, tattooing is widespread, its distribution as compared with the related custom of scarification being determined by the color of the skin. In general, light-skinned races tattoo, while dark-skinned peoples practice scarring. In Oceania the practice is especially developed among the Polynesians.

The original significance of tattooing is disputed. It has been held by some that it had a religious or social meaning, but the best evidence goes to show that it was at first purely ornamental in character. It must indeed be admitted that in many instances the tattooed designs have a tribal or clan or even a religious meaning, but this usage is probably derived from the decorative. The patterns range from simple lines and dots to complex designs. Probably the fullest development of the custom among primitive peoples is in New Zealand, and the Marquesas Islands, though it is also much practiced in various parts of the East Indian archipelago. The tattooing of the natives in North and South America and in parts of the world other than those mentioned above is, as a rule, simple. In modern times and among higher races the Japanese have brought the art to its highest state of perfection. The prevalence of the practice among sailors of all nationalities is well known, but in both these cases the patterns in use have entirely lost their primitive characteristics and are of civilized origin. Consult: J. A. E. Lacassagne, *Les tatouages* (Paris, 1881); Wilhelm Joest, *Tätowiren, Narbenzeichnen und Körperbemalen* (Berlin, 1887); H. G. Robley, *Moko; or Maori Tattooing* (London, 1896); Augustin Kraemer, *Die Samoainseln* (Stuttgart, 1902).

TAU, tou. See CHINESE LANGUAGE; TAOISM.

TAUBERT, tou′bĕrt, WILHELM (1811–91). A German pianist and composer, born in Berlin. He studied philosophy at the university there, at the same time studying composition under Berger and Klein, and afterward taught music until 1831, when he became conductor of the court concerts. In 1842 he was appointed conductor of the royal opera. He was a member of the Academy of Arts from 1834 and president of the musical section of the same from 1875. His works include the operas *Die Kirmes* (1832), *Macbeth* (1857), *Cesario* (1874), music for the *Medea* of Euripides, and Shakespeare's *Tempest*. His songs were popularized by Jenny Lind and other noted singers.

TAU BE′TA PI ASSOCIATION. A college honorary technical fraternity that was organized in Lehigh University, South Bethlehem, Pa., in 1855. It derives its name from the initials of three Greek words that form the secret motto of the association. The Tau Beta Pi bears the same relation to engineering and similar studies as the Phi Beta Kappa (q.v.) does to literary scholarship, and the Sigma Xi (q.v.) does to original research in science.

The object of the fraternity is to mark in a fitting manner those who have conferred honor upon their Alma Mater by a high grade of scholarship as undergraduates, or by their attainments as alumni, and to foster a spirit of liberal culture in the technical and scientific schools of America.

There were in 1914, 27 chapters in as many different colleges and technical schools and 5699 members, of whom 5029 were active, 412 graduate, and 258 honorary members.

The badge is a watch charm or scarf pin of gold, shaped like the bent of a trestle. On its obverse there are engraved the secret name and symbols of the association, while on the reverse the name of the chapter appears on the cap of the bent, and on the sill are the name and class of the owner. The colors of Tau Beta Pi are seal brown and white.

Tau Beta Pi has published since March, 1906, an octavo quarterly magazine called *The Bent of Tau Beta Pi*, and also in 1911 issued a *Catalogue of the Tau Beta Pi Association* to which have since been added periodic supplements.

TAUBMANN, toup′män, OTTO (1859–). A German composer, born at Hamburg. At first he followed a commercial career, but later entered the Dresden Conservatory, where his teachers were Wüllner and Nicodé. In 1886–89 he was director of the Conservatory at Wiesbaden, in 1891–92 theatre conductor at St. Petersburg. In 1895 he settled in Berlin as critic of the *Berliner Börsen Courier*. At one bound he attained fame when his great choral work, *Eine Deutsche Messe* (for soli, chorus, orchestra, and organ), was produced at Dortmund in 1898. His other works, all cast in large form, are: *Psalm XIII* (for soli, chorus, and orchestra); *Tauwetter* (for male chorus and orchestra); *Krieg und Frieden* (chorus and orchestra); the choral drama *Sängerweihe* (1904).

TAUCHNITZ, touk′nĭts, CHRISTIAN BERNHARD, BARON (1816–95). A German publisher, born near Naumburg, a nephew of the following. His firm, founded in Leipzig (1837), was noted for its accurate classical and biblical texts, its dictionaries and other works of reference. In 1841 Tauchnitz began a *Collection of British* (and American) *Authors*, now extending to over 4000 volumes and widely read on the Continent. English authors were paid a royalty by Tauchnitz, who thus helped to establish the present international copyright law. A similar collection of translated *German Authors* was begun in 1866 and *Students' Tauchnitz Editions* of English and American works began to appear in 1886 with German notes and introductions. Tauchnitz was made Baron in 1860, British Consul General for Saxony in 1872, and member of the Saxon House of Peers in 1877.

TAUCHNITZ, KARL CHRISTOPH TRAUGOTT (1761–1836). A German publisher, born in Grossbardau. He began to print books in 1797 at Leipzig. He was the first to use stereotype plates (1816) in Germany. His stereotyped editions of the classics were once widely famed alike for their cheapness, their convenience, and their accuracy. He thus printed a Bible in Hebrew and the Koran in Arabic. By his will Leipzig received 4,500,000 marks for charitable ends. The business was continued by his son Karl Christian (1798–1884).

TAU (tou) **CROSS.** See ANTHONY, SAINT, CROSS OF.

TAUERN, tou'ĕrn. A division of the eastern Alps, including the principal section of what was known to the ancients as the Noric Alps (Map: Austria, C 3). It lies between the rivers Drave and Mur on the south and the Enns on the north, and extends from Brenner Pass in eastern Tirol through the Austrian crownlands of Salzburg and Carinthia into north Styria. The system consists of two main divisions, the Hohe (high) Tauern in the west, and the Niedere (low) Tauern in the east. The whole system has a length of about 150 miles and a width of 28 miles. It is wholly of Archean formation, consisting chiefly of gneiss in the west and mica-slate in the east, with some granite. The western or Hohe Tauern, as their name implies, are considerably higher and more rugged than the eastern. Their main range forms a sharp ridge with steep sides rising above the snow line and carrying over 250 glaciers, from which numerous mountain torrents fall in cataracts down the steep valleys. The highest peak in the system is the Grossglockner, with an altitude of 12,461 feet.

TAULER, tou'lĕr, JOHANN (1300–61). A German mystic. He was born at Strassburg and when 15 years old entered the Order of the Dominicans. When the "black death" visited Strassburg in 1346, he stuck to his post and comforted the people. Excepting for preaching tours into the Rhineland, where he came into contact with the Friends of God (q.v.), he remained in Strassburg until his death. Tauler was an emotional yet practical mystic and left a large number of sermons full of evangelistic life. *The Book of Spiritual Poverty*, formerly ascribed to him, has been more recently regarded as a compilation. See a translation of extracts, *Golden Thoughts from the Book of Spiritual Poverty* (Edinburgh, 1897). Of the various editions of Tauler's works, the Frankfort edition of 1826 is the most complete.

Bibliography. C. Schmidt, *Johannes Tauler* (Hamburg, 1841); Susanna Winkworth, *Tauler's Life and Times* (London, 1857; new ed., New York, 1907); Nicolas von Basel, *Bericht von der Bekehrung Taulers*, edited by C. Schmidt (Strassburg, 1875); W. Preger, *Geschichte der deutschen Mystik*, vol. iii (Leipzig, 1893); A. W. Hulton, *The Inner Way; 36 Sermons from John Tauler* (ib., 1905); *Conferences and Sermons of John Tauler*, translated by Rev. W. Elliott (Washington, 1911). See also MYSTICISM.

TAUNTON, tăn'tọn. The capital of Somersetshire, England, in the valley of the Tone, 38 miles southwest of Bristol (Map: England, D 6). The streets are wide and are well paved. The Church of St. Mary is of Perpendicular architecture, and is famous for its ornamented tower; that of St. James was the conventual church of an Augustinian priory. Taunton has an extensive museum in the remains of the Norman castle. It has manufactures of silk, gloves, and hosiery. Ina, King of the West Saxons, built a castle in Taunton about 700 A.D. This was soon after destroyed, but another fortress was built on the site soon after the Conquest, at which period the town had a mint. Pop., 1901, 21,078; 1911, 22,563. Consult Toulmin, *History of Taunton* (Taunton, 1822).

TAUNTON. A city and one of the county seats of Bristol Co., Mass., 36 miles south of Boston; on Taunton River, and on the New York, New Haven and Hartford Railroad (Map: Massachusetts, E 5). It is regularly laid out with finely shaded streets, and has many handsome residences. Among its institutions are a State Insane Hospital, Morton Hospital, the Old Ladies' Home, and Bristol Academy. The Public Library contains 55,000 volumes. Other important collections are the Bristol County Law Library and that of the Old Colony Historical Society. The city hall, county courthouse, the post office, registry of deeds, and the jail are buildings of merit. There are several pleasure grounds, of which Taunton Green and Woodward Springs Park are the more noteworthy.

Taunton carries on a large trade, being the business centre of a number of towns in the vicinity. It has also important industrial interests, the various establishments according to the census of 1909 having $16,504,000 capital, and an output valued at $15,380,000. The principal manufactures are cotton goods, stoves, and silverware. There are machine shops, wood-working establishments, and manufactories of copper ware, tacks, wire nails, stove lining, carriages, buttons, boxes, oilcloth, brick, printing presses, twist drills, cotton machinery, aluminium goods, pearl jewelry, eyelets, etc. The iron industry was established here in 1652.

The government is vested in a mayor and nine councilmen, elected at large. The water works, and the electric-light plant, are owned by the municipality. Pop., 1900, 31,036; 1910, 34,259; 1915 (State census), 36,161.

Settled in 1638 as Cohannăt, Taunton was incorporated under its present name in 1639. It was made a shire town in 1746 and was chartered as a city in 1865. The first permanent settlement in Vermont was made by a company from Taunton in 1736. Consult *Quarter-Millennial Celebration of the City of Taunton* (Taunton, 1889); Emery, *History of Taunton* (Syracuse, 1893).

TAUNTON, BARON. See LABOUCHÈRE, HENRY.

TAUNUS, tou'nụs. A mountain range of west Germany, in the Prussian Province of Hesse-Nassau, extending about 55 miles in a northeast direction from the right bank of the Rhine near its confluence with the Main (Map: Germany, C 3). It consists mainly of schists and quartzites, and reaches its highest elevation, 2713 feet, in the northeast. It is steepest, however, in the southwest, where many crags are crowned with ruined castles. The higher portions of the range are forest-clad, and the lower slopes are covered with vineyards yielding some of the best of Rhenish wines. The range is famous for numerous mineral springs, including those of Wiesbaden, Homburg, and Nauheim.

TAURIC CHERSONESE, tạ'rĭk kĕr'sō-nēz. See CHERSONESUS, 2; IPHIGENIA.

TAURIDA, tou'rĭ-dȧ. A government of European Russia, consisting of the peninsula of the Crimea (q.v.) and a portion on the mainland connected with the peninsula by the Isthmus of Perekop (Map: Russia, D 5). Area, about 24,497 square miles. No other government in European Russia presents such striking natural contrasts as this. The region north of the isthmus is mostly flat and its climate is considerably colder than that of the peninsula. The principal river of the mainland portion is the Dnieper, which forms its northwest boundary.

This part of the government is well adapted by its steppelike surfaces for stock raising. Large numbers of merino sheep are reared. Wheat, rye, barley, and oats are produced extensively. The cultivation of industrial plants and fruits is confined principally to the peninsula. The chief manufactures are flour, tobacco, and some iron products. The population is very cosmopolitan. In 1912 it numbered 1,965,900, of whom the Russians constituted about 71 per cent and the Tatars about 13 per cent. The capital is Simferopol (q.v.). See Crimea.

TAURIDA, Prince of. See Potemkin, G. A.

TAU'RIN (from Lat. *taurus*, bull, so called because first discovered in the bile of the ox), or Amido-Ethyl-Sulphonic Acid, $C_2H_4(NH_2)SO_3H$. A substance occurring, as a constituent of taurocholic acid, in the bile and in other animal products and tissues. When pure it forms six-sided glistening prisms, perfectly transparent, neutral, devoid of odor, soluble in water, but insoluble in alcohol and ether.

TAU'RUS. A series of mountain ranges in the southern part of Asia Minor forming the southern boundary of the Anatolian Plateau, which covers the central part of the peninsula (Map: Turkey in Asia, C 3). It follows the Mediterranean coast from the Euphrates towards the Ægean Sea. On the north it slopes gradually towards the plateau, but on the south it falls in steep terraces towards the sea. The Taurus has many peaks above 10,000 feet, being highest near the eastern end. Between the ranges rivers flow to the sea from the inner plateau. A northeastern extension from the Sihun River in alignment with the eastern Taurus is known as the Anti-Taurus.

TAURUS (Lat., bull). The second sign of the zodiac (q.v.), its conventional symbol being ♉. The constellation Taurus contains the two famous star groups known as the Pleiades and the Hyades (qq.v.), in the latter of which is situated the brilliant red star Aldebaran (q.v.). Other interesting objects in this constellation are λ Tauri, an Algol variable with a period of 3.9 days, and the Crab nebula, so called from its shape.

TAUSEN, tou'sen, Hans (1494–1561). A Danish leader in the Reformation, born at Birkende, in Fyn. From 1523 to 1525 he studied at Wittenberg under Luther, after his return fearlessly preaching the doctrines of the Reformation. He met great antagonism from the clergy, but was popularly successful. In 1537 he became professor of Hebrew in Copenhagen University, and in 1542 Bishop of Ribe. In worship he employed the people's mother tongue instead of Latin, wrote hymns, a postil, and pamphlets in Danish, and translated part of the Bible. Tausen was the first and one of the foremost of Danish followers of Luther, an able and powerful preacher, and gifted as a poet and linguist. H. F. Rördam edited part of his writings in 1870.

TAUSIG, tou'sĭk, Karl (1841–71). A German pianoforte virtuoso, born in Warsaw. He received his first instruction from his father, and completed his education with Liszt in 1855–59. He became famous for technique and interpretative ability, and won a world-wide reputation by the concert tours that occupied his short life. He was connected with the musical life of Dresden (1859–60), Vienna (1862), and Berlin (1865), in which latter city he founded a "Schule des höheren Clavierspiels," which he gave up in 1870. Of his composition and arrangements the great proportion are classical pianoforte works which he edited. He also prepared and edited a new edition of Clementi's *Gradus ad Parnassum*, and arranged the piano score of Wagner's *Meistersinger*. He composed and published two *Etudes de concert* (F♯ and A♭), also *Ungarische Zigeunerweisen*, *Nouvelles soirées de Vienne*, and *Valses-Caprices* on themes from Strauss.

TAUSSIG, tous'sĭg, Frank William (1859–). An American economist, born in St. Louis. He graduated at Harvard in 1879, and after teaching there for 10 years, became professor of economics in 1892. In 1904–05 Taussig was president of the American Economic Association. His publications include: *The Tariff History of the United States* (1888; 6th ed., rev., 1914), a standard work; *Protection to Young Industries as Applied to the United States* (1883; 2d ed., 1886); *History of the Present Tariff, 1860–83* (1885); *The Silver Situation in the United States* (1892; 3d ed., rev., 1896); *Wages and Capital* (1896); *Principles of Economics* (1911; 2d ed., 1915); *Some Aspects of the Tariff Question* (1915); *Inventors and Money Makers* (1915), Brown University lectures. He also edited *State Papers and Speeches on the Tariff* (1892); and for some years was editor in chief of the *Quarterly Journal of Economics*.

TAU-TAI. See Taotai.

TAU'TOG (Massachusetts Indian *tautauog*, pl. of *taut*, sheep's head, the Indian name of the fish). An American food fish (*Tautoga onitis*) of the family (Labridæ) to which the wrasses of Europe belong. It is found from Maine to South Carolina, especially along the coast of southern New England, on rocky and weedy bottoms, where it lives on mollusks, crustaceans, worms, sand dollars, etc. It is abundant, is of considerable importance as a food fish, and is locally known as blackfish and oysterfish. It may attain an extreme weight of 22 pounds, with a length of 3 feet, but the average weight is about three pounds. The annual catch amounts to about 1,500,000 pounds, valued at $60,000. The tautogs spawn in May and June, and are very prolific, a large fish yielding more than a million eggs, which are small and buoyant, and hatch in four or five days. Consult G. B. Goode, *Fishery Industries*, sec. i (Washington, 1884); Jordan and Evermann, *American Food and Game Fishes* (New York, 1905).

TAV'ERNER, Richard (c.1505–75). An English religious writer. He was born at Brisley, Norfolk; graduated at Oxford in 1529; was clerk of the signet under Thomas Cromwell, and managed to retain court favor after Cromwell's fall (1540). In 1545 he was returned to Parliament, and by the King's gift came into possession of much property. Under Edward VI he maintained his position. Early won for the Reformation and the author of a translation of the Augsburg Confession (1536) and other original and translated works in the interest of Protestantism, and a licensed lay preacher under Edward VI, he still was unmolested by Mary, although he lost his office. Under Elizabeth he came again into royal favor and was high sheriff at Oxford (1569). Taverner's principal literary work was a revision of Thomas Matthew's Bible of 1537, upon the suggestion of Thomas Cromwell. It was the first complete Bible ever printed in England (London, 1539).

TAVERNIER, tȧ'vâr'nyā', Jean Baptiste, Baron d'Aubonne (1605–89). A French traveler, born in Paris. He became a dealer in precious stones, and between 1638 and 1663 made a number of journeys to Turkey, Persia, India, and the East Indies. His *Six Voyages en Turquie, en Perse, et aux Indies* (1676), edited by Chappuzeau and La Chapelle, went through many editions. Consult V. Ball's translation, *Travels in India* (1889), with a biographical sketch of Tavernier.

TAVIRA, tȧ-vē′rȧ. A seaport town of the Province of Algarve, Portugal, 136 miles southeast of Lisbon, on both sides of the river Gilão, at its mouth (Map: Portugal, B 4). The harbor is navigable for small vessels and affords an important commerce in mineral waters and white wines. The town has also sardine and tunny fisheries. Pop., 1900, 12,178.

TAV′ISTOCK. A market town in Devonshire, England, picturesquely situated on the west border of Dartmoor, about 35 miles southwest of Exeter, and 12 miles north of Plymouth, in the fertile valley of the Tavy, which is crossed by two bridges within the town (Map: England, B 6). There are iron foundries and mining works, copper, lead, tin, and iron being found in decreasing quantity in the neighborhood. The parish church, dating from 1318, is a handsome edifice. Tavistock was formerly of great importance, owing to its abbey, the largest and most magnificent in Devonshire, which was founded in the year 961, for the Benedictine Order. The refectory and abbey gateway still exist. Pop., 1901, 5043; 1911, 4392.

TAVOY, tȧ-voi′. The capital of a district of the same name in Tenasserim, Lower Burma, 160 miles west by north of Bangkok, on the Tavoy River, 30 miles from its mouth (Map: Burma, C 4). It is the shipping point for the rice and fruit of the surrounding region, and manufactures earthenware, silk, and salt. Tavoy has been a British possession since 1824. Pop., 1901, 22,371; 1911, 25,063.

TAVRIS, tȧ-vrēs′. A town of Persia. See Tabriz.

TAWAKONI, tȧ-wä′kô-nĕ. An important Caddoan tribe of the Wichita group (q.v.). See Waco.

TAWING. See Leather.

TAWNY, or **TENNÉ.** The term for orange color in heraldry (q.v.), represented in engraving by diagonal lines running from the sinister chief point and crossed by horizontal lines.

TAX, Single. See Single Tax.

TAXACEÆ, tăks-ā′sē-ē. A family of Conifers including forms commonly called yew, ground hemlock, etc. It comprises 5 genera and about 20 species, occurring chiefly in the Northern Hemisphere. Formerly it included the Podocarpaceæ (see Podocarpus) of the Southern Hemisphere. The most familiar North American representative is *Taxus canadensis* (American yew, ground hemlock, etc.).

TAX AND TAXATION (OF., Fr. *taxe*, from ML. *taxa*, *tasca*, taxation, tax, from Lat. *taxare*, to touch, rate, appraise, estimate). A tax is a compulsory contribution from private income or wealth to meet the general expenses of government. The purpose of taxation is primarily the securing of revenue, although it may incidentally subserve political, social, or moral ends. The common element in all forms of taxation is the destination of the revenue derived from them—to cover general expenses of government. This characteristic serves to distinguish from taxes such compulsory payments as fees and special assessments (see Assessor), which are primarily payments to meet costs incurred in affording special public services to the individuals who pay them.

Taxation, while it is to-day by far the most important source of public revenue, is of comparatively recent origin. The mediæval state depended for its revenues largely upon the product of the public domain. (See Finance.) It was in the cities that taxation first developed. Payment of taxes was generally regarded as prerequisite to citizenship. With the increase in public needs which accompanied the development of the national state various forms of indirect taxes—tolls, import duties—were levied and with the extension of citizenship characteristic of the modern state the duty of paying taxes has become practically universal. The broadening of the functions of the state, noted under Finance, has had the effect of making taxation an increasingly important element in economic life. In general the higher the social and economic development of a nation, the heavier is the burden of taxation upon its citizens.

Principles of Taxation. Writers on finance are accustomed to lay down certain general principles of justice and of administration to which practical systems should conform. Taxes should be capable of yielding a large revenue; they should be economical, i.e., the cost of collection should not materially increase the burden imposed upon the taxpayer; they should be elastic, capable of responding to a sudden demand for revenue; they should not impair their source through discouraging industry. So far as possible they should be collected in such a way as to cause the taxpayer the least inconvenience; they should be certain, so that each man might know what he might be expected to pay and make provision accordingly. Most important of all, they should be equitably distributed.

On what principle the distribution of taxes should be made is a question on which financial theorists are far from an agreement. In the first half of the nineteenth century most writers regarded a tax as a payment to the state for protection or for the privilege of securing an income under the laws of the state. It followed from this view that taxes should be distributed according to the benefit received or according to the cost incurred by the state in affording the benefit. Such a principle proved unsatisfactory, since both benefit and cost are indeterminable. In recent years the doctrine which has the widest following teaches that, since civilized existence is conditioned by the state, each individual is born with the duty of contributing to the needs of the state in proportion to his ability or faculty. This theory more nearly than any other corresponds with public sentiment and with the actual practice of taxation.

Proportional, Progressive, and Degressive Taxation. A system of proportional taxation is one in which the contribution from income or wealth remains a constant percentage, whatever the size of the latter may be. It is defended on the ground that it approximates the ideal of taxation according to ability. Progressive taxation, in which the contribution increases relatively to income or wealth, may be defended on the same ground, since one who possesses a large income is obviously more able to surrender a certain percentage of it than one who has a small income is to surrender an equal percentage.

More often it is advocated as a measure of social equalization. Degressive taxation, in which the contribution diminishes relatively to income or wealth, has no valid defense; it exists only because of the imperfection of the taxing machinery, which finds less difficulty in levying upon small aggregates of wealth than upon large.

An ideal system of taxation would be a single tax on incomes. Such a tax would have to take account of the necessary expenditures of individuals, since these affect faculty; it would also take account of the character of income, whether funded or unfunded, since the former, being more certain, places its recipient in a better economic position than the latter. Income taxes, however, have proved practicable to only a limited extent. (See below.)

A tax on all property would approximate the same end, since the value of property is closely dependent upon the income it yields. This tax was practicable enough when almost all property was tangible and incapable of concealment. It is the most unsatisfactory of systems when, as at present, a vast amount of property consists in intangible personalty. For these reasons a multiple system of taxation, direct and indirect, is necessary to provide satisfactory revenues and to approximate fairness in distribution.

Shifting and Incidence of Taxation. The problems of taxation are immensely complicated by the fact that a tax may not rest upon the persons who pay it in the first instance, but may be shifted in whole or in part through price changes. A tax upon the output of a factory would naturally result in an equal rise in price. The manufacturer might pay the tax, but its ultimate incidence is upon the consumer. A tax on houses might temporarily be borne by the owner, but in the nature of the case it would ultimately result in higher rents, since it would put a check upon building. A tax on land value, on the other hand, could not be shifted, since it would not affect the amount of land available for use, and hence could not raise rents.

Capitalization of Taxation. Closely allied to the phenomenon of shifting is that of capitalization. A special tax falling upon an income-yielding property from which it cannot be shifted, e.g., a landed holding, tends to depress the value of the property by the capital value of the tax. Subsequent purchasers of the property are not burdened by the tax, since full allowance for it is made in the purchase price.

Direct and Indirect Taxes. A classification of taxes of much practical importance is that which distinguishes between direct and indirect. The distinction cannot be sharply drawn, but it may in general be said that direct taxes are those which are levied upon the persons or property of those upon whom they are expected to rest, while indirect taxes are levied upon commodities or industrial processes with the expectation of their further diffusion. Examples of the former kind are the poll tax, the general property tax, and the income tax. Examples of indirect taxes are customs duties and excise taxes. The practical advantage of indirect taxation lies in its ease of collection and in the fact that it creates a minimum of opposition on the part of the taxpayer, who does not recognize that he is paying a tax through the enhancement of price of articles which he may purchase or not as he chooses. This very fact gives rise to one of the chief disadvantages of such taxation, viz., that it encourages wasteful administration, since the financier is not held to such strict account for funds raised in this way. A further objection to indirect taxation is that it weighs most heavily upon the poor, since it is only commodities in general use which can yield a considerable revenue through indirect taxation.

Forms of Taxation. The simplest form of taxation is the poll tax, a head tax levied equally upon all citizens or inhabitants. This tax was not uncommon in England towards the close of the Middle Ages; it was an important form of taxation in the New England colonies. Where it still exists it is of minor importance. A tax on general property was developed in the northern Colonies of America. Taxes on houses are discussed under the title HOUSE TAX (q.v.).

A notable development in taxation has been the imposition in many countries of special taxes upon the land. In almost all the cities of New Zealand local revenues are raised chiefly from proportional taxes upon the unimproved value of the land, and the same system is widely employed in Australia and western Canada. A trace of the same system appears in the Pennsylvania law permitting the cities of Pittsburgh and Scranton to introduce gradually heavier rates on land than on buildings. New Zealand also has state taxes graduated according to the size of holding and special taxes on absentee holdings. Western Canadian communities levy special taxes on unimproved land, and the same principle appears in the British system adopted in 1910–11. Germany and England also levy taxes upon the increase in value of land, as indicated by prices at successive transfer, or by appraisal.

For inheritance tax see that title.

The chief forms of indirect taxes are customs duties (see TARIFF) and excise taxes, or taxes upon the production or sale of commodities. The latter are common wherever business is highly developed. They are employed in England to offset duties on imports, which would otherwise serve to protect the native producer.

Taxation in the United States. There are no constitutional restrictions upon the power of the Federal government over taxation save that "no capitation or other direct tax shall be laid unless in proportion to the census or enumeration," "no tax or duty shall be laid on articles exported from any State," "no preference shall be given . . . to the ports of one State over those of another," and "that all duties, imposts, and excises shall be uniform throughout the United States." The power of the States to tax is also practically unlimited, except that they may not tax interstate commerce, levy import or export duties, or exercise the right of taxation in a manner to impair the obligation of a contract or to confiscate property without due process of law. The State constitutions in many cases place further limitations upon the power of taxation exercised by the State governments. The two fields of national and State taxation have been on the whole well defined and separate since the adoption of the Federal Constitution. While there is no legal objection to the right of the State to levy excise taxation, the prohibition of taxation of like commodities entering the State by interstate commerce renders this right nugatory; the States are therefore practically confined to direct taxation, and the Federal government has refrained from entering this field of taxation except in periods of great national emergency. Areas of conflict do, however, appear in the income, corporation, and inheritance taxes. Both income and inheritance taxes are employed by the Federal government and some of the States. While the inheritance tax has not been employed by the Federal government except in emergencies, the trend of financial opinion favors the adoption of a Federal tax.

State Taxation. In the majority of the United States the basis of the fiscal system is found in the general property tax, levied both for State and local purposes, on realty and personalty of the inhabitants of the State. This tax, although general, has long been severely criticized by taxation experts. Recent tendencies have been in the direction of breaking up the general property tax through the separate treatment of special forms of property, especially corporate property, and the relegation of the tax on general property to local purposes. Confined to tangible property and levied for local purposes, the tax on property may, in the opinion of experts, be stripped of most of its abuses. Through the inefficiency and occasional dishonesty of assessors, and through their frequent dependence upon popular favor, property of all sorts, and more especially personal property, escapes its just burdens, while in many cases the system of basing the taxation of the State upon the local assessment leads to a competition among the various districts of the State to keep their local assessment unreasonably low and thus evade, as far as possible, the burden of the State general property tax. The resulting inequalities are only partially remedied by the various State boards of equalization which now exist in about one-half of the States and which exercise the right to raise or lower the assessment of counties and in cases even to alter the assessment of individuals. It has, moreover, been found impracticable to secure good results by imposing severe penalties for evasion or by paying portions of the tax to persons discovering such evasions.

Mortgages are taxed in most States together with the other forms of personalty, and as no deduction is usually made in the assessment of mortgaged property, the imposition of the tax on mortgages usually amounts to double taxation. Attempts have been made in Massachusetts, California, Oregon, and elsewhere to prevent this double taxation of mortgaged property.

In connection with the general property tax many of the Southern States also depend upon a number of license or privilege taxes upon various forms of business or exhibitions. In the South the tax is not graduated, but is usually a fixed charge, and according to Seligman (*Essays in Taxation*) is the natural result of the economic constitution of the South in the past. The aristocratic landed interests did not desire to tax themselves by land or poll (slave) tax, but attempted to shift the burden in Colonial days by taxing imports and exports and, after the adoption of the Constitution of the United States, by levying business taxes or licenses.

A few States levy an income tax, in some cases instead of the general property tax, in others in connection with it. The income tax law of Massachusetts has survived from Colonial days. It exempts incomes under $2000, taxing only the excess, and exempts also the income from property already taxed. It is laxly administered. The Wisconsin income tax law, as a result of excellent administration, has proved to be a satisfactory source of revenue and has led to a change of view among taxation authorities as to the practicability of State income taxes as a minor source of revenue.

The assessment of the property of corporations by local bodies under the general property tax has everywhere been found to be inadequate, and the expedient has commonly been resorted to of assessing the property of such corporations by a State board instead of by local assessors. Corporations are taxed, however, on another basis than that of the value of their property. According to Professor Seligman the basis of taxing corporations in the United States has been: (1) the value of the property; (2) the cost of the property; (3) the capital stock at par value; (4) the capital stock at market value; (5) the capital stock plus the bonded debt at market value; (6) the capital stock plus total debt, both funded and floating; (7) the business transacted; (8) gross earnings; (9) dividends; (10) capital stock according to dividends; (11) net earnings; (12) value of franchise. Several States have accepted gross revenue or net earnings as a basis for taxation, and in several States, Wisconsin, Michigan, etc., this tax is progressive. A feature of recent taxation is the so-called special franchise tax. A tax of this sort which falls upon "franchises for the use of streets granted by municipalities to public-service corporations," was passed by the New York Legislature in 1899, and a somewhat similar tax was levied in New Jersey in 1900. One of the most serious drawbacks to the just and equitable taxation of corporations lies in the interstate location of their property and the interstate character of their business and the consequent frequent conflicts of jurisdiction. To prevent this Prof. Henry C. Adams advocates the Federal taxation of interstate commerce, while another authority on finance (Professor Seligman) urges uniformity of State action or, in default thereof, taxation by the Federal government and subsequent redistribution of such revenue among the States.

Federal Taxation. The revenue of the Federal government has been obtained principally from customs and internal revenue duties. Down to 1848 the internal revenue receipts were relatively insignificant except for the years 1814–18, when they averaged over $3,000,000 as compared with customs receipts of about $20,000,000. From 1849 to 1862 no internal revenues were collected. Under the stress of the Civil War a vast number of internal duties were imposed, and from 1864 to 1868 the internal revenues exceeded the customs in yield. After the restoration of normal conditions the internal revenue receipts fell to a level somewhat below the customs and except sporadically did not surpass the customs until the years of the Spanish War finance (1898–1902). Since 1911 the internal revenue receipts have uniformly exceeded the customs receipts, partly in consequence of the two new elements—the corporation tax, first affecting yield in 1910, and the income tax, affecting yield in 1914.

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ed., ib., 1913); id., *Income Tax* (2d ed., ib., 1914); R. M. Haig, *The Exemption of Improvements from Taxation in Canada and the United States* (ib., 1915); also references under Finance and Political Economy.

TAXATION OF COSTS. The official confirmation of the amount of costs due a successful litigant. It is a ministerial act usually performed by the clerk of the court, but subject to review by the court. In England costs are taxed before a taxing master or registrar, and in Scotland before an auditor. See Costs.

TAX DEED. An authenticated instrument by which a public officer transfers land sold for taxes. The validity of the deed depends upon the regularity of the tax sale and compliance with the statutes. Delivery of the deed may be compelled by mandamus or restrained by injunction. The deed is not made until after the time for redemption has expired. See Tax Sale.

TAXICAB. See Motor Vehicle.

TAX'IDER'MY (from Gk. *τάξις*, *taxis*, arrangement + *δέρμα*, *derma*, skin). The art of skinning, preserving, and stuffing the skins of animals, and of properly mounting them. All animals should first be carefully measured, according to measurements prescribed by taxidermists. Drawings and if possible casts should be made of parts whose form and expression are characteristic and can be expressed in no other way. These precautions have reference to the mounting of the animals in a lifelike attitude and form. Mounting requires experience and, for the greatest success, an artist's eye for form and a sculptor's skill in modeling. The skin should be carefully removed from the body to the tips of the toes and to the bill in the case of the bird. Directions as to where and how far to cut the skins of the various sorts of animals may be found in taxidermists' guides. The skin should not be cut at the claws and beak, and in the case of birds, the skull should be left within the skin. Clean the leg and skull bones of all flesh, clear out the brain, and preserve the skin and all it contains by anointing it thoroughly on the inside with arsenical soap. Many taxidermists prefer to have the entire pelvic and pectoral girdles preserved at least.

Subsequent treatment depends somewhat on whether the specimen is to be mounted, and upon the facilities at hand, and the ease and cost of transportation. Except in the case of young, and of certain species, the skins of mammals, whether preserved in the field or in the laboratory, should if possible be preserved wet, in a salt and alum bath. The proportions recommended by Hornaday are: to one gallon of water add ¾ of a pound alum (one pint) and 1¾ pounds salt (one quart); heat to near the boiling point until the crystals are all dissolved. When possible test with a salometer, where liquid should stand at 15°. Do not allow the liquid to remain in a zinc or galvanized vessel. Immerse the skins in the cooled solution. For the first two or three days do not allow the skins to crumple or fold, and to facilitate the penetration of the fluid to all parts of the skins stir them about in the fluid. Keep greasy skins by themselves and replace a dirty and bloody preservative by a clean one.

Skins for mounting should be preserved dry only when the lack of facilities and the cost of transportation render the wet method prohibitive. By the dry method the skins may be preserved with arsenical soap. When the soap is all absorbed the skins should be dusted with finely powdered salt and alum in equal proportions. Very good skins may be prepared with salt alone in an emergency; but such skins should be guarded against the attacks of insects, rats, mice, cats, dogs, etc.

Bird skins may be preserved either with powdered arsenic and alum or with arsenical soap. Before removing the skin of a bird plug the vent and nostrils with cotton. Dirt and blood spots should then be washed out with water and the feathers dried with generous and repeated sprinkling of meal, plaster of Paris, or sawdust. The skin having been removed and anointed with the preservative, replace the skull (using great care here as elsewhere not to stretch or tear the delicate skin); gently fill the eye sockets and throat with cotton to their natural fullness; wind the wing bones and legs with cotton to an amount equal to the muscles removed, and gently draw them down into the skin of the arms and legs, which should be placed in a natural position. Then make as close an imitation of the body as possible (of cotton for little birds and of tow for large ones), insert it into the skin, packing it in just sufficiently to fill out all the natural roundness and no more, and draw the skin over it. Next smooth all the feathers carefully, lay the wings naturally beside the body, and tie them there by many windings of thread round and round the whole length of the body. This done lay the bird on its back on a board, stretch out the beak and tail, and fasten them in position if necessary and leave the specimen in an airy place until thoroughly dried. A light label should be attached to the leg. Skins so preserved are better for study purposes than when mounted, as they are easily handled, take less room in a cabinet, and are more easily cared for. When properly preserved they may be prepared for mounting at any time by softening by means of wrapping in damp cloths.

The mounting of skins is a very elaborate process, and good results depend not only upon acquired skill, but upon a knowledge of anatomy, bionomics, and good artistic taste. In the case of the smaller birds and animals it consists of arranging wires lengthwise of the body and the limbs, so connected as to support the body in a lifelike attitude; but large animals must have the substance of the body replaced by some firm material, such as clay or some plastic composition, which must be modeled with great intelligence if the figure is to be satisfactory.

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TAXILA, tăks'ĭ-lȧ (Lat., from Gk. *Τάξιλα*, from Skt. *Takṣakaśila*, rock of Takshaka, a Naga king, or from Pali *Takkasīla*, rock of the Takkas, a tribe living between the Indus and the Chenab). A famous city of ancient India. It was situated near the modern village of Dheri Shahan, on the little stream Tabranala, in the District of

Râwalpindî, in the Punjab. It was one of the most populous and wealthy of all the cities of India, and seat of an important university famous for instruction in the medical sciences. It was the residence of Aśoka (q.v.) while he was Viceroy of the Punjab. The Sus or Abars became its masters in 126 B.C., only to lose it at the beginning of the next century to Kanishka, King of the Kushans. Consult: J. W. McCrindle, *Invasion of India by Alexander the Great* (London, 1896); id., *Ancient India as Described in Classical Literature* (ib., 1901); V. A. Smith, *Early History of India* (3d ed., Oxford, 1914).

TAX'IS (Neo-Lat., from Gk. *τάξις*, arrangement). A term applied by botanists to movements by free-swimming organisms, spores or sperms, in which the direction of the movement is determined by the direction of the applied stimulus. Similarly directed movements in fixed plant organs are termed tropisms. Zoölogists often use tròpism to cover taxis as well. Tactic responses may be positive, in the direction of the stimulus source; negative, away from the stimulus source; or diatactic, at right angles to the lines of stimulus. They may be called forth by a variety of stimuli, as light (phototaxis), chemical nature of the substance (chemotaxis), or varying osmotic pressure of the medium (osmotaxy).

TAXON'OMY (from Gk. *τάξις*, *taxis*, arrangement + *νόμος*, *nomos*, law, from *νέμειν*, *nemein*, to distribute) IN PLANTS. The classification of plants. Probably the first scientific study of plants was the attempt at classification. Artificial classifications, beginning with the most ancient one into herbs, shrubs, and trees, and culminating in the Linnæan system (see BOTANY) in the middle of the eighteenth century, were at first necessary on account of lack of knowledge of the structure of plants. Such classifications simply catalogued and pigeonholed the rapidly accumulating material, in preparation for a classification based upon natural relationships. Natural systems have been evolving since the eighteenth century; being modified by every advance in morphological knowledge, none are abreast of current opinion, and no final classification seems to be in sight. Each newly proposed system, however, approaches to it. The present system is a composite one, not being referable to any single systematist, but having had a somewhat natural and very slow development. In its larger outlines it is presented below. All of the groups mentioned are described under their several titles.

At present four primary divisions of the plant kingdom are recognized, as follows:

IV. Spermatophytes or Seed plants.
III. Pteridophytes or Fern plants.
II. Bryophytes or Moss plants.
I. Thallophytes or Thallus plants.

These categories are distinct enough, and there is no difficulty in assigning all plants to them; but the question arises: Are they equivalent groups? Some think there should be more primary groups, and others fewer. Beginning with the lowest great division there is an increasing complexity. An easy differential way of separating the groups is as follows: *Thallophytes* have thallus bodies but no archegonia (q.v.); *Bryophytes* have archegonia but no vascular bundles; *Pteridophytes* have vascular bundles but no seeds: *Spermatophytes* have seeds.

I. **Thallophytes**, the least natural group of the four, comprise what seems to be a heterogeneous mass of forms. They are divided into two great parallel series, algæ and fungi, the former containing chlorophyll (green pigment) and being independent plants, the latter containing no chlorophyll and being parasites or saprophytes. The algæ are usually subdivided as follows:

Algæ
- Rhodophyceæ or red algæ.
- Phæophyceæ or brown algæ.
- Chlorophyceæ or green algæ.
- Cyanophyceæ or blue-green algæ.

It is a serious question whether the Cyanophyceæ should be included in this way with the other algæ, for they appear to be far more nearly related to the bacteria, a group of fungi. The classification of the fungi is in a very unsatisfactory state, but the plants are for the most part being treated under the following heads:

Fungi
- Basidiomycetes or basidium fungi (toadstools and their allies, including rusts and smuts).
- Ascomycetes or sac fungi (mildews, lichen fungi, etc.).
- Phycomycetes or algalike fungi (molds, downy mildews, etc.).
- Schizomycetes or fission fungi (bacteria).
- Myxomycetes or slime molds.

The first three groups are regarded as true fungi; the last two are problematical as to their relationships, often being regarded as distinct from the fungi.

II. **Bryophytes** form a very natural group, the two great series being liverworts (Hepaticæ) and mosses (Musci). Their principal subdivisions are as follows:

Bryophyta
- Musci
  - Bryales.
  - Sphagnales.
- Hepaticæ
  - Anthocerotales.
  - Jungermanniales.
  - Marchantiales.

III. **Pteridophytes** also form a natural group, though the main divisions are very dissimilar in appearance. The prominent existing groups are as follows:

teridophyta
- Lycopodiales or club mosses.
- Equisetales or horsetails.
- Filicales or ferns.

IV. **Spermatophytes** should probably be divided into two primary groups, although at present they are treated as one. The two great divisions, gymnosperms and angiosperms, differ more in essential features from one another than does the former group from pteridophytes, but they are held together at present by the common character of seed production. The existing gymnosperms are grouped as follows:

Gymnospermæ
- Gnetales.
- Coniferales (pines and their allies).
- Ginkgoales (maiden-hair tree).
- Cycadales (cycads).

The angiosperms comprise a vast assemblage of forms that are easily separated into two great series, monocotyledons and dicotyledons, but whose further division is at present in a somewhat chaotic state. Most of the subdivisions heretofore suggested are confessedly artificial, and probably as far as one may go safely with natural groups is as follows:

Angiospermæ
- Dicotyledones....
  - Sympetalæ.
  - Archichlamydeæ.
- Monocotyledones.

The unit of classification used by taxonomists is the species, a group very difficult to define, but understood in a general way. The species always bears two names, as *Quercus alba*, the systematist's name for white oak, *alba* indicating the species, and *Quercus* the genus to which the species belongs. In some cases forms of a species may be distinct enough to be characterized, and are called varieties, being designated by adding a third name to the species binomial. The next higher taxonomic group is the genus, which comprises one or more species. For example, *Quercus* is the oak genus, containing many species. The next higher taxonomic catetory is the family, which comprises one or more genera, and is indicated except in a few exceptional cases by the common termination "aceæ," as "Rosaceæ," the rose family. The next higher category is the order, the form of whose designation is not so fixed as that of the family, but which is increasingly indicated by the termination "ales," as "Coniferales." Still higher categories are often employed, but the usage is so variable that nothing definite can be stated in reference to them. All of these categories have their intermediate subdivisions, which general usage has in the main established. For example, a genus may have its species grouped into subgenera; a family may be broken up into tribes, each containing its own genera; and an order often has its suborders.

The literature of taxonomic botany is vast in extent, and a complete list of even the most important works cannot be cited. No work as yet contains a systematic presentation of all the known species of plants. The most extensive current works are as follows: Engler and Prantl, *Die natürlichen Pflanzenfamilien* (Leipzig), completed in four sections, each containing numerous parts, and including all known genera; Bentham and Hooker, *Genera Plantarum* (London, 1863–83), including all known genera of flowering plants; Engler, *Das Pflanzenreich* (Leipzig), many parts of which have appeared, and which is planned to be completed in 20 years, including descriptions of all known species of plants.

Each country has its own manuals containing descriptions of its flora. The current manuals dealing with the flowering plants and in some cases the fern plants of the United States are as follows: Gray, *Manual of Botany* (7th ed., rev. by Robinson and Fernald, New York, 1908), including northeastern United States; Britton and Brown, *Illustrated Flora of the Northern United States and Canada* (ib., 1896–98); N. L. Britton, *Manual of the Flora of the United States and Canada* (ib., 1901), including the same range; A. W. Chapman, *Flora of the Southern United States* (3d ed., Cambridge, Mass., 1897); J. K. Small, *Flora of the Southeastern States* (New York, 1903), including region south of Maryland and Kentucky west to 100th meridian; Coulter and Nelson, *New Manual of Rocky Mountain Botany* (ib., 1909); E. L. Greene, *Manual of the Botany of the Region of San Francisco Bay* (San Francisco, 1894); Thomas Howell, *A Flora of Northwest America* (Portland, Oreg., 1903); P. A. Rydberg, *Flora of Montana* (New York, 1900); id., *Flora of Colorado* (Fort Collins, Colo., 1906); Piper, *Flora of the State of Washington* (Washington, D. C., 1906). Manuals for various other regions are appearing as the demand for them develops. An attempt to include in a single work the whole vascular flora of North America is Asa Gray, *Synoptical Flora of North America*, incomplete (1874–97). The most inclusive work is *North American Flora* (New York Botanical Garden), presenting the whole plant kingdom within its range. Each group is presented by specialists and many parts have appeared. For the important taxonomic literature of algæ and fungi, see articles on the principal groups. See BOTANY.

TAX SALE. A public sale of land, by proper officials, for delinquent taxes assessed thereon. The requisites and details to be followed vary in the different States, but the general principles are common. The taxes must be constitutional and legally assessed; they must be due and unpaid; a proper return of the delinquency must have been made. The sale must be public and to the highest bidder, and it must be advertised to be held at a proper time and place. The whole proceeding must be strictly in conformity with the statute. As each particular parcel of land is liable for the taxes assessed upon that and no more, each parcel must be sold separately. In certain States, where a division is practicable, it is mandatory upon the tax collector to sell only such portion of the land as will satisfy the unpaid taxes. The purchaser is given a certificate, and the owner usually has a certain period to redeem upon payment of the taxes, interests, and costs. At the end of the period the purchaser is entitled to receive a tax deed (q.v.). See TAX AND TAXATION; TAX DEED; TAX TITLE.

TAX TITLE. The interest or title acquired by a purchaser of land at a tax sale. If the sale be valid, the validity of the title depends upon the failure of the owner to redeem within the proper time. Until the expiration of the time allowed for redemption the purchaser has practically only a right in the nature of a lien on the property. See TAX SALE.

In most States the deed is prima facie evidence of title in the purchaser. In many States, after the expiration of the time for redemption, a tax title is made superior to all other claims. In a few States, however, the purchaser gets only the right of the delinquent taxpayer, and therefore the title may be precarious. Tax titles are often considered uncertain because questions of a strict compliance with the statute as to the assessment, delinquency, and sale are involved. When the tax title of a purchaser in good faith proves to be invalid for any reason, he is generally allowed to recover the purchase price and may recover from the owner the actual value of any reasonable improvements he may have made. See TAX AND TAXATION; TAX SALE; TITLE.

TAY, tā. A river of Scotland with interesting changes in direction due to longitudinal and transverse valleys (Map: Scotland, E 3). It rises on the border of Argyllshire, and flows first eastward, traversing the beautiful Loch Tay, then southeast, and finally northeast as the Firth of Tay, a broad tidal estuary tributary to the North Sea, 10 miles below Dundee. It is 118 miles long and navigable for small vessels to Perth, though the mouth of the estuary is obstructed by sand banks. The estuary is spanned by an iron railroad bridge 3593 yards long.

TAY, LOCH. A lake in West Perthshire, Scotland, situated in a rock basin, 355 feet above the sea level. It is about 15 miles long, with an average breadth of one mile, and varies from 100 to 600 feet in depth (Map: Scotland, D 3). Its picturesque features and salmon fishing make it a favorite tourist and angling resort. Ben Lawers, on its western side, rises 3984 feet.

TAYABAS, tȧ-yä′bȧs. A province of Luzon, Philippine Islands, occupying the isthmian portion between the central and southern part of the island, and the region along the east coast of central Luzon, formerly included under the districts of Infanta and Príncipe (Map: Philippine Islands, C 3). These two districts and the large island of Polillo (q.v.) lying to the east of them were annexed to the province in 1902. Total area, 5993 square miles, of which the dependent islands take up 491, and of these the island of Polillo, 333 square miles. The entire mainland portion is occupied by a high coast range covered with forests and generally inaccessible and unexplored. The northern districts are undeveloped, but in Tayabas proper there are some agriculture and cattle raising, and considerable mechanical industries, including weaving, the manufacture of hats, cigar boxes, and coconut oil, and boat building. Pop., 1903 (exclusive of the subprovince of Marinduque), 153,065, almost entirely Tagalog. There are also some Negritos. Capital, Lucena.

TAYABAS. A town of Tayabas Province, Luzon, Philippines, situated on the east bank of the river of the same name, 65 miles southeast of Manila (Map: Philippine Islands, C 3). It is the centre of a large inland and coast trade, and has a dockyard. Pop., 1903, 14,740.

TAYGETUS, tȧ-ĭj′ė-tŭs (Lat., from Gk. *Ταΰγετος*), now called Pentedaktylon. The principal mountain range of the Peloponnesus, Greece (Map: Greece, D 7). It extends southwestward from the west coast of the peninsula and forms the central one of the three promontories in which south Greece terminates. It reaches in Mount Hagios Elias an altitude of 7903 feet. It formed the ancient boundary between Laconia and Messenia.

TAY′LER, John James (1797–1869). An English Unitarian clergyman. He was born at Newington Butts, London; graduated at the University of Glasgow in 1818; and was minister of a Unitarian congregation at Manchester (1820–53). In 1840 he was appointed professor of ecclesiastical history in Manchester New College, and in 1852 also professor of theology. When the college was removed to London (1853), he became its principal. With the Rev. James Martineau he was pastor of the Unitarian congregation in Little Portland Street (1859–60). He published *Christian Aspects of Faith and Duty* (2 series, 1851, 1877); *Attempts to Ascertain the Character of the Fourth Gospel* (1867; 2d ed., 1870). J. H. Thom published Tayler's *Life and Letters* (London, 1872).

TAY′LOR. A borough in Lackawanna Co., Pa., 4 miles southwest of Scranton, on the Lackawanna River, and on the Central of New Jersey, the Delaware and Hudson, and the Delaware, Lackawanna, and Western railroads (Map: Pennsylvania, K 3). Its interests are coal mining and silk manufacturing. The place was settled in 1790 and incorporated in 1893. Pop., 1900, 4215; 1910, 9060; 1915 (U. S. est.), 11,591.

TAYLOR. A city in Williamson Co., Tex., 35 miles northeast of Austin, on the Missouri, Kansas, and Texas, and the International and Great Northern railroads (Map: Texas, D 4). The buildings and grounds of the Fair Association, the city hall, and the artesian wells are noteworthy. Taylor is the centre of extensive cotton interests, and has considerable trade in farm produce, live stock, wool, etc., and manufactures of machine-shop products, flour and cottonseed oil. The International and Great Northern Railroad maintains repair shops here. Pop., 1900, 4211; 1910, 5314.

TAYLOR, Alfred Edward (1869–). A British philosopher. He studied at New College, Oxford, and was a fellow of Merton. He taught at Owens College, Manchester (1896–1903), was next Frothingham professor of philosophy at McGill University, Montreal, and after 1908 held the chair of moral philosophy at St. Andrews. His writings include: *The Problem of Conduct* (1901); *Elements of Metaphysics* (1903); *Aristotle on his Predecessors* (1906); *Plato* (1908); *Thomas Hobbes* (1908); *Epicurus* (1911); *Varia Socratica* (1911); *Aristotle* (1912).

TAYLOR, Alfred Swaine (1806–80). An English toxicologist and medical jurist, born at Northfleet, Kent. He studied in the united hospitals of Guy and St. Thomas in 1823. In 1831 he began to deliver at Guy's Hospital the first English course of lectures on medical jurisprudence. In 1832 he became joint lecturer with Aikin on chemistry at Guy's, and he held this chair alone from 1850 to 1870. His *Manual of Medical Jurisprudence* (1844) and *The Principles and Practice of Jurisprudence* (1865) passed through many editions. He first drew attention to the great incentive for secret murder offered by life insurance, and to the possibility of arsenical poisoning from wall papers and other fabrics. Among his numerous writings was a *Handbook on Poisons* (1848).

TAYLOR, Ann (Mrs. Josiah Gilbert) (1782–1866) and Jane (1783–1824). English writers for children, whose prose and verse were popular throughout the English-speaking world. They were born in London, but the family early removed to Lavenham, Suffolk, and later to Colchester. The sisters published jointly *Original Poems for Infant Minds* (1804), which was translated into German, Dutch, and Russian; *Rhymes for the Nursery* (1806, containing Jane's familiar "Twinkle, twinkle, little star"); and *Hymns for Infant Minds* (1808). After Ann Taylor's marriage they worked separately, without as much success. Their earlier work, marking an epoch in young people's literature, has held its own. E. V. Lucas edited *The Original Poems, and Others* in 1903, and in 1915 Mary Macleod edited *Ann and Jane Taylor* in the "Children's Poets Series." Their brother, Isaac Taylor (q.v.), edited *Memoirs and Correspondence of Jane Taylor* (2 vols., London, 1825), and Ann's son, Josiah Gilbert, edited *The Autobiography of Mrs. Gilbert* (ib., 1874).

TAYLOR, (James) Bayard (1825–78). An American poet, man of letters, journalist, and traveler, born at Kennett Square, Chester Co., Pa. His education was obtained in the common schools of the neighborhood. He became, in 1842, the apprentice of a printer, and here he published his first volume, *Ximena: or the Battle of the Sierra Morena, and Other Poems* (1844). In 1844–45 he made a pedestrian tour through Europe, describing his experiences in *Views Afoot: or Europe Seen with Knapsack and Staff* (1846). The following year, 1847, he joined the New York *Tribune*, and remained on the staff of that paper as long as he lived, publishing in its pages the sketches of many of his subsequent books. As its special correspondent, he visited California in 1849, where he spent five months among the gold diggers; two years later he was in Egypt, Asia

Minor, and Syria; in 1852–53 in India, crossing from Bombay to Calcutta, and then going to China to join the expedition of Commodore Perry to Japan. From 1862 to 1863 he was secretary of the United States legation at St. Petersburg, and later chargé d'affaires there, and was influential in securing for the northern States the sympathy of Russia. In 1874 he was again in Egypt, and the same year at the Millennial Celebration in Iceland. For several years previously he had lived in Germany, and there, and in America and England, in 1870 he brought out the work for which he is best known, his excellent translation of Goethe's *Faust*. In 1876 he wrote the *Ode* in honor of the opening of the Centennial Exhibition in Philadelphia. In February, 1878, he was appointed Minister to Germany, and went again to that country, but died there towards the end of the same year, leaving unfinished biographies of Goethe and Schiller. He was married in 1850 to Miss May Agnew, who died the same year, and in 1857 to Miss Marie Hansen of Gotha, Germany, who survived him, reëdited his works, and, with H. E. Scudder, wrote his *Life and Letters* (Boston, 1884).

Taylor's work is voluminous, and varied both in kind and in quality. He wrote books of travel, of which the chief are: *El Dorado: or Adventures in the Path of Empire* (1850); *A Journey to Central Africa* (1854); *A Visit to India, China, and Japan* (1855); *The Land of the Saracen* (1854); *Northern Travel* (1858); *Travels in Greece* (1859); *At Home and Abroad* (1859–62); *Colorado* (1867); *By-Ways of Europe* (1869); *Egypt and Iceland in the Year 1874* (1874); and others. His novels include: *Hannah Thurston* (1863); *John Godfrey's Fortunes* (1864); *The Story of Kennett* (1866); *Joseph and his Friend* (1870). His poems were also numerous; besides *Ximena*, the notable volumes are: *Rhymes of Travel, Ballads, and Other Poems* (1848); *A Book of Romances, Lyrics, and Songs* (1851); *Poems of the Orient* (1854); *Poems of Home and Travel* (1855); *The Poet's Journal* (1862); *The Picture of St. John* (1869); *The Ballad of Abraham Lincoln* (1869); *The Masque of the Gods* (1872); *Lars, A Pastoral of Norway* (1873); *The Prophet, A Tragedy* (1874); *Home Pastorals, Ballads, and Lyrics* (1875); and *The National Ode* (1876). Two posthumous collections of Taylor's miscellanies appeared—*Studies in German Literature* (1879) and *Essays and Notes* (1880). He had a distinct lyrical faculty, but he never seemed able to bring his varied powers under full artistic control. The public persisted in regarding him as a traveler and journalist rather than as a poet, and, despite the remonstrances of some friendly critics, it is probable that the public was right. At most he is a minor poet, a good translator, and a versatile writer of prose. Consult: Marie Hansen-Taylor (his wife) and H. E. Scudder, *Life and Letters of Bayard Taylor* (2 vols., Boston, 1884), and Mrs. Taylor, *On Two Continents: Memories of Half a Century* (New York, 1905); A. H. Smyth, *Bayard Taylor* (Boston, 1886), in "American Men of Letters"; W. D. Howells, *Literary Friends and Acquaintance* (New York, 1900); William Winter, *Old Friends* (ib., 1909).

TAYLOR, Bert Leston (1866–). An American writer. He was born at Goshen, Mass., and was educated at the College of the City of New York. He joined the staff of the Chicago *Tribune*, and in that connection became widely known for his humorous column called "A Line-o'-Type or Two." His writings include: *Line-o'-Type Lyrics* (1902); *The Well in the Wood* (1904); *The Log of the Water Wagon* (1905); *The Charlatans* (1906); *Extra Dry* (1906); *A Line-o'-Verse or Two* (1911); *The Pipesmoke Carry* (1912); *Motley Measures* (1913).

TAYLOR, Brook (1685–1731). An English mathematician, born at Edmonton, Middlesex. He was educated at Cambridge. In 1712 he was made a fellow of the Royal Society, and two years later became its secretary. Taylor is chiefly known for a theorem which bears his name, and which appeared in his *Methodus Incrementorum Directa et Inversa* (1715), the first important treatise to deal with the calculus of finite differences. Taylor also contributed in a valuable way to the problem of the centre of oscillation (*Philosophical Transactions*, xxviii), to the theory of vibrations of a string, and other questions of mathematical physics. His *Linear Perspective* (1715) and *New Principles of Linear Perspective* (1719) were a notable advance in the theory. They also contained an enunciation of the principle of vanishing points, the first in English and the most complete to that time. For biography consult the preface to his posthumous work, *Contemplatio Philosophica* (1793).

TAYLOR, Charles Fayette (1827–99). An American orthopedic surgeon, born in Williston, Vt., and educated at the University of Vermont. The year 1857 he spent in London, studying the Swedish movement cure under Roth. Subsequently he settled in New York City, and was one of the first to introduce the movement cure (see Mechanotherapy) into America. Dr. Taylor became a specialist in orthopedic surgery, and was very successful. He was especially skillful in devising original appliances to meet deformities. Among his inventions are the Taylor splint for treatment of curvature of the spine and the long extension hip splint. He was the founder of the New York Orthopædic Dispensary and Hospital, of which he was the executive surgeon for many years. Taylor established in New York City an institute for the treatment of deformities, which was successfully operated for many years, previously to the organization of the hospital. He wrote much on the subjects in which he specialized.

TAYLOR, Dan (1738–1816). Founder of the New Connection of General Baptists. He was born in Yorkshire, England, where he worked in the mines till 1762. After having been for a year one of Wesley's preachers he seceded, but continued preaching. In 1763 he united with the General Baptists and rose to prominence as a preacher among them. In 1769 he headed a secession from that body. (See Baptists.) His better known works embrace: *A Compendious View of Christian Baptism* (1772); *Fundamentals of Religion* (1775); and *The Eternity of Future Punishment* (1789, written against the Universalist Elhanan Winchester). Consult Adam Taylor, *Memoirs of Rev. Dan Taylor* (London, 1820), and W. Underwood, *Life of Rev. Dan Taylor* (ib., 1870).

TAYLOR, David Watson (1864–). An American naval constructor, born in Louisa Co., Va. He graduated with the highest honors from the United States Naval Academy in 1885, and received also the highest honors from the Royal College at Greenwich, England, where he studied in 1885–88. In the United States navy he was promoted through the various grades to captain in 1901, and in 1914 became chief of the Bureau of Construction. He was awarded a gold medal by the British Institution of Naval Architects for the best original paper on "Ship-Shaped Stream Forms." Taylor published *Resistance of Ships and Screw Propulsion* (1893; 2d ed., 1907) and *The Speed and Power of Ships* (1910).

TAYLOR, Edward Thompson (1793–1871). An American preacher, widely known as Father Taylor. He was born in Richmond, Va.; was taken in charge by a lady near that city; ran away to sea at the age of seven, and for 10 years was a sailor. In the War of 1812 he served on a privateer, the *Black Hawk*, was captured, and was confined first at Melville Island and then in Dartmoor Prison, where he became the chaplain to his fellow prisoners, having joined the Methodist Episcopal church in 1811. After his release from prison he was successively a peddler of tin and ironware and a buyer of rags, and a farmer; was regularly licensed to preach in 1814; and in 1819 became an itinerant Methodist minister. In 1829 he was chosen minister of the newly established Seamen's Bethel in Boston, which position he held until 1868, when he resigned. He visited Europe in 1832 and Palestine in 1842, and was chaplain to the United States frigate sent with relief to Ireland during the famine of 1846. By his warmth of heart, his native wit, and his natural eloquence he gained a remarkable influence over his sailor auditors. Numerous anecdotes have been told to illustrate his wit and his power as a public speaker, and accounts of his eloquence may be found in Miss Martineau's *Retrospect of Western Travel*, in Buckingham's *America, Historical, Statistic, and Descriptive*, in Dickens's *American Notes*, in Miss Bremer's *The Homes of the New World*, and in Mrs. Jameson's *Commonplace Book of Thoughts, Memories, and Fancies*. Consult Haven and Russell, *Father Taylor, the Sailor Preacher* (Boston, 1872), and Robert Collyer, *Father Taylor* (ib., 1906).

TAYLOR, Emily Heyward Drayton (Mrs. J. Madison Taylor) (1860–). An American miniature painter. She was born in Philadelphia, and studied there at the Pennsylvania Academy and in Paris under Cécile Ferrier. Good examples of her miniatures, which are carefully drawn and somewhat detailed and realistic in treatment, are those of President and Mrs. McKinley, Dr. S. Weir Mitchell, Mrs. Clement Newbold, Miss Edith Moore Taylor, Mrs. Eugene Hale, Mrs. Cyrus McCormick, Emmons Blaine. Mrs. Taylor made her residence in Philadelphia, became a member of the Pennsylvania Academy of Fine Arts and president of the Society of Miniature Painters, and received gold medals at London (1900) and at Charleston (1902). She collaborated with Anne Hollingsworth Wharton in *Heirlooms in Miniature* (1898).

TAYLOR, Sir Frederick Williams (1863–). A Canadian financier, born at Moncton, New Brunswick. He entered the service of the Bank of Montreal in 1878, by 1906 had become manager of the London branch, and in 1913 was appointed general manager at Montreal. During his eight years in London he became the head of British colonial banking interests there, and the Bank of Montreal was the medium through which \$500,000,000 of Canadian loans were placed on the London market, besides about \$125,000,000, the proceeds of Canadian Pacific Railway stock issues.

TAYLOR, Frederick Winslow (1856–1915). An American efficiency engineer, born at Germantown, Pa. In 1883 he graduated M.E. from Stevens Institute of Technology. Between 1878 and 1889 he was employed by the Midvale Steel Company at Philadelphia as foreman, master mechanic, chief draftsman, and chief engineer. Thereafter he devoted himself to organizing the management of manufacturing concerns, including the Bethlehem Steel, Cramp's Shipbuilding, and the Midvale Steel companies. Taylor was the originator of scientific management in business, which quickly grew to an important movement. He patented about 100 inventions, and devised the Taylor-White process for treating high-speed tools, for which he received a gold medal at Paris in 1900. In 1906 he served as president of the American Society of Mechanical Engineers. Taylor was author of *Concrete, Plain and Reënforced* (1905; 2d ed., 1911), with S. E. Thompson; *Art of Cutting Metals* (1906); *Concrete Costs* (1912), with Thompson; *The Principles of Scientific Management* (1911; Fr. trans., 1916); *Shop Management* (1911). Consult C. B. Thompson, *Scientific Management* (Cambridge, Mass., 1914).

TAYLOR, George (1716–81). A signer of the Declaration of Independence, from Pennsylvania. He was born in Ireland, emigrated to America as a redemptioner in 1736, and, after serving a wealthy manufacturer as a clerk, married his employer's widow. He became very wealthy, was a member of the Provincial Assembly from 1764 to 1770, and on July 20, 1776, was chosen a member of the Continental Congress. He served only a short time, retiring in March, 1777. Consult John Sanderson, *Biography of the Signers to the Declaration of Independence*, revised and edited by R. T. Conrad (Philadelphia, 1847).

TAYLOR, Graham (1851–). An American social worker, born at Schenectady, N. Y. He graduated from Rutgers College in 1870, and from the Reformed Theological Seminary at New Brunswick, N. J., in 1873. From 1880 to 1892 he was pastor of the Fourth Congregational Church at Hartford, Conn., for the last four years of this period serving also as professor of practical theology at Hartford Seminary. In 1892 he was appointed professor of social economics at the Chicago Theological Seminary, and from 1894 he was resident warden of the Chicago Commons Social Settlement, which he had founded. In addition he held the presidency of the Chicago School of Civics and Philanthropy, and served as an associate editor of *The Survey*. He wrote *Religion in Social Action* (1913), which is, in a sense, autobiographical.

TAYLOR, Hannis (1851–). An American lawyer and diplomat, born at Newbern, N. C. He was educated at the University of North Carolina. From 1893 to 1897 he was United States Minister to Spain. Later he practiced law in Washington, D. C. He published *The Origin and Growth of the English Constitution* (2 vols., 1898–99), a work in which he attempted not only to trace the history of the English system of government, but also the growth therefrom "of the Federal Republic of the United States." Taylor published also *International Public Law* (1902); *The Science of Jurisprudence* (1908); *The Origin and Growth of the American Constitution* (1911). Taylor championed the claims supporting Pelatiah Webster (q.v.).

TAYLOR, Sir Henry (1800–86). An English poet, born at Bishop-Middleham in Durham. He began writing verses in the Byronic manner and was soon contributing clever articles to the *Quarterly Review*. Encouraged by Southey, whom he visited at the Lakes, he settled in London as a man of letters (1823). In 1824 he was given a clerkship in the Colonial Office, a post which he filled with great ability till his resignation in 1872. He made warm friendships with Mill, Lockhart, Rogers, Carlyle, Spedding, Aubrey de Vere, and many other literary men. In recognition of his services to the government and to literature, he was made K.C.M.G. (1869). His last years were passed at Bournemouth. Taylor's literary fame rests secure on *Philip Van Artevelde* (1834; performed by Macready, 1847), one of the most poetic tragedies since the Elizabethan age. Other tragedies in the same style but of less merit are *Isaac Comnenus* (1827), *Edwin the Fair* (1842), and *St. Clement's Eve* (1862). *The Virgin Widow*, a dramatic poem (1850), is an experiment in romantic comedy. In 1847 Taylor published *The Eve of Conquest and Other Poems*. His strongest prose is represented by *The Statesman* (1836), a collection of ironical discourses on success, which were taken seriously; and by a charming *Autobiography* (1885; but privately printed, 1877), containing carefully drawn portraits of his early contemporaries. Consult his *Works* (author's ed., 5 vols., London, 1877–78); selection from poems in Miles, *Poets and Poetry of the Century* (ib., 1891); and *Correspondence*, edited by Edward Dowden (ib., 1888).

TAYLOR, Henry Clay (1842–1904). An American naval officer, born in Washington, D. C. He graduated at the Naval Academy in 1863, was assigned to the West Gulf Blockading Squadron, and took part in the battle of Mobile Bay (Aug. 5, 1864). After the Civil War he spent two years in the South Pacific station, and on his return home was detailed for duty at the Naval Academy. In 1868 he was promoted to the rank of lieutenant commander, and after taking part in a surveying expedition (1870–71) he again spent two years at the Naval Academy. In 1879 he was advanced to the rank of commander, and from 1881 to 1884 he commanded the *Swatara* on the Asiatic station. Two years after his return he was appointed commandant of the Norfolk Navy Yard, a post which he held two years. From 1893 to 1896 he was president of the Naval War College at Newport, R. I. In 1897 he was again ordered to sea service, and was appointed commander of the battleship *Indiana*. In the spring of 1898 he joined Admiral Sampson's fleet at Key West, and in May he took part in the bombardment of San Juan. The next month, with the *Indiana* and other war vessels, he conveyed General Shafter's army from Tampa to Santiago, and on July 3, when Cervera came out of the harbor, his vessel took an important part in the destruction of the Spanish fleet. After the war he was placed in command of the receiving ship *Vermont*, and in 1902 he was appointed chief of the Bureau of Navigation.

TAYLOR, Henry Ling (1857–). An American surgeon, born and educated in New York City (M.D., 1881, College of Physicians and Surgeons). He followed his father, Charles Fayette Taylor (q.v.), in the practice of the latter's specialty. In 1902 he became professor of orthopedic surgery at the Postgraduate Medical School and Hospital, New York. He published *Orthopedic Surgery for Practitioners* (1909).

TAYLOR, Henry Osborn (1856–). An American scholar, born in New York City. He graduated at Harvard in 1878 and at Columbia Law School in 1881. From the former institution he received the degree of Litt.D. in 1912 and in 1915 he was made a member of the National Institute of Arts and Letters. In addition to a law book—*Treatise on Law of Private Corporations* (1884; 5th ed., 1902)—he published: *Ancient Ideals: A Study of Intellectual and Spiritual Growth from Early Times to the Establishment of Christianity* (2 vols., 1900; 2d ed., 1913); *The Medieval Mind* (2 vols., 1911; 2d ed., 1914); *The Classical Heritage of the Middle Ages* (1901; 3d ed., 1912); *Deliverance: The Freeing of the Spirit in the Ancient World* (1915).

TAYLOR, Hobart Chatfield Chatfield-. See Chatfield-Taylor, H. C.

TAYLOR, Isaac (1787–1865). An English miscellaneous writer, inventor, and artist, born at Lavenham, in Suffolk. He studied engraving under the direction of his father, with whom he executed the plates for Boydell's *Illustrations of Holy Writ* (1820), commended for their originality by Rossetti. Turning to literature, he joined the staff of the *Eclectic Review* (1818), for which he continued to write for many years. Some time before this he had begun the study of patristic literature and of Lord Bacon. He was known as the great lay preacher of his time. Of his publications we may mention: *The Elements of Thought* (1823; 11th ed., 1867), which grew out of his early studies of Bacon and the Church Fathers; a translation of the *Characters of Theophrastus* (1824), with etchings by himself; *The Natural History of Enthusiasm* (1829; 10th ed., 1845); *Saturday Evening* (1832), a devotional volume which had an immense sale in England and the United States; *Home Education* (1838; 7th ed., 1867); a translation of the *Jewish Wars* of Josephus (1847 and 1851); *Ancient Christianity and the Doctrines of the Oxford Tracts* (8 parts, 1839–40; 4th ed., 1844); and *The Spirit of Hebrew Poetry* (1861). Consult Taylor's *Memorials of the Taylor Family of Ongar* (London, 1867). See also Taylor, Ann and Jane.

TAYLOR, Isaac (1829–1901). An English ecclesiastic, born at Stanford Rivers, Essex. He was educated at King's College, London (1847–49), and Trinity College, Cambridge (1850–53), and in 1857 became curate of Trotterscliffe, Kent. In 1885 he became canon of York Minster. He was the author of *The Liturgy and the Dissenters* (1860), and one or two other theological pamphlets; but was best known by his works on philology. His *Words and Places* (1864; 2d ed., 1865) was a work of great research as well as erudition. In *Etruscan Researches* (1874) Taylor tried to prove that Etruscan was not Indo-European, but was probably akin to the Ural-Altaic (q.v.) or agglutinative group of languages. In 1879 he published his *Greeks and Goths*, in which he developed his theory that the runes were of Greek origin. This was followed by his best-known work *The Alphabet* (2 vols., 1883; 2d ed., 1899), on which his scientific reputation mainly rests.

In 1889 came his *Origin of the Aryans* (2d ed., 1902; Fr. trans., 1895) which was important in overthrowing Max Müller's theory that central Asia was the primitive home of the Indo-European races. His last important publication was *Names and their Histories* (1896; 2d ed., 1897).

TAYLOR, Isidore Justin Sévérin, Baron (1789–1879). A French antiquarian and artist. The son of an English-born French citizen, he was educated in Paris; he devoted his life chiefly to travel, though in 1838 he was appointed Inspector General of Fine Arts. His life work is mainly embodied in a marvelous series of 24 folio volumes entitled *Voyages pittoresques et romantiques de l'ancienne France*, the publication of which covered the entire period from 1820 to 1863, and engaged the services of such artists as Géricault, Ingres, H. Vernet, and Viollet-le-Duc (qq.v.) besides Baron Taylor's own drawings and the editorial assistance of Charles Nodier and A. de Cailleux. The art of lithographic illustration with the aid of the camera lucida was carried to the highest perfection, especially in the later volumes, and although the original plan of the work was never completed, its influence in stimulating interest in the national monuments of France, especially those of the Middle Ages, can hardly be overestimated. Baron Taylor also published illustrated volumes of travel in Spain and Portugal (3 vols., 1826–32); Syria, Egypt, and Palestine (3 vols., 1835); Jerusalem (1841); Switzerland and the Pyrenees (1843).

TAYLOR, James Knox (1857–). An American architect, born in Knoxville, Tenn. He studied architecture in the Massachusetts Institute of Technology (1877–79), and in architects' offices as draftsman for three years thereafter; and practiced his profession independently in St. Paul, Minn., from 1882 until 1892 and then for three years in Philadelphia. Entering the service of the supervising architect of the United States Treasury in Washington in 1895, he became senior draftsman in 1896 and from 1897 to 1912 was supervising architect. Under his incumbency the office of the supervising architect at Washington was raised to a high plane of artistic and practical efficiency, and the Federal buildings designed by that office or erected under its supervision from plans of other architects were uniformly creditable to the government. In 1912 Taylor became director of the department of architecture of the Massachusetts Institute of Technology.

TAYLOR, James Monroe (1848–). An American educator. He was born in Brooklyn, N. Y., and graduated from the University of Rochester in 1868 and from the Rochester Theological Seminary in 1871. Between 1873 and 1886 he was pastor of Baptist churches at South Norwalk, Conn., and Providence, R. I. Thereafter until 1914 he served as professor of ethics in and president of Vassar College. In 1910–14 he was a trustee of the Carnegie Foundation for the Advancement of Teaching. The art building given to Vassar by C. M. Pratt in 1914 was named in honor of Dr. Taylor. He wrote: *Elements of Psychology* (1892); *A New World and an Old Gospel* (1901); *Before Vassar was Opened* (1914); *Vassar* (1915), with E. H. Haight.

TAYLOR, Jeremy (1613–67). An English prelate and author. He was born at Cambridge, the son of a barber, and educated at Caius College. He was ordained before he had reached his twenty-first year, and attracted the attention of Laud, who procured him a fellowship at All Souls, Oxford. About the same time he was made chaplain to the King, and in 1638 rector of Uppingham. His first notable publication was *Episcopacy Asserted* (1642). His stand on the Church-and-King side cost him his living. For a while he accompanied the royal army, and then retired into Wales, where he opened a school at Newton in Carmarthenshire and became chaplain to the Earl of Carbery. Here he produced his most memorable works—the *Liberty of Prophesying*, on behalf of the expelled Anglican clergy, in 1647; the *Life of Christ* and the *Holy Living* in 1649; the *Holy Dying* in 1652; and a number of other devotional and controversial books. In 1660, with a dedication to Charles II, appeared his *Ductor Dubitantium, or the Rule of Conscience in All her General Measures*, the most learned, subtle, and curious of all his works. Promotion was a matter of course to one who was at once a stanch royalist, a profound theologian, and a consummate writer; and before the year was out he was made Bishop of Down and Connor. He was not happy in his Irish see, from which he prayed to be delivered as from "a place of torment." The Scotch Presbyterian ministers who had occupied the livings under the Commonwealth disputed his belief in the invalidity of their ordination, and were only ejected with difficulty. He remained at his post, however, until his death. Taylor, sometimes styled the English Chrysostom on account of his golden eloquence, has few equals for richness of fancy. His inexhaustible imagery, full of tender beauty, touched with the characteristic melancholy of the age, reminds us of Shakespeare and Spenser and Fletcher rather than of a sober theologian. His style is perhaps seen at its best in his sermons, though his *Holy Living* and *Holy Dying*, for their deep and practical piety, have been popular devotional manuals for each generation since his time. The best complete edition of his works is that by Eden in ten vols. (London, 1847–52), with a memoir by Bishop Heber. Consult also E. H. May, *Dissertation on the Life, Theology and Times of Jeremy Taylor* (London, 1892); Edward Dowden, in *Puritan and Anglican* (ib., 1900); E. W. Gosse, *Jeremy Taylor* (ib., 1904); George Worley, *Jeremy Taylor* (new ed., ib., 1907); E. A. George, in *Seventeenth Century Men of Latitude* (New York, 1908).

TAYLOR, John (1580–1653). An English writer, styled by himself the "King's water poet." He was born at Gloucester. After studying there at the grammar school, he was apprenticed to a London waterman. Pressed into the navy, he served under Essex at Cadiz (1596), and, by his own statements, made many voyages in the Queen's ships. Retiring from the navy from lameness, he became a waterman on the Thames, and superintended river pageants. As trade waned, owing largely to the fashion for coaches, he began writing doggerel, which attracted attention and secured him the patronage of men of letters. On the outbreak of the Civil War (1642) he went to Oxford, where he opened a public house. Returning to London (1645), he took the Crown Tavern in Long Acre. There he died. Though hardly a poet, his work is interesting as a picture of contemporary manners. Of his separate publications, numbering about 150, may be mentioned the *Penniless Pilgrimage* (1618), an account of a trip to Scotland; *Laugh and Be Fat* (1613); *Praise of Hempseed* (1620), an account of a voyage from London to Queensborough, in Kent, in a brown-paper boat; and *Three Weeks . . . Travel from London to Hamburgh* (1617). In 1630 Taylor brought out an edition of his writings under the title *All the Works of John Taylor, the Water Poet, being 63 in number.* This folio was reprinted by the Spenser Society (three parts, London, 1868–69). Other pamphlets not contained in the edition of 1630 were also reprinted by the same society (five parts, 1870–78). For a selection consult his *Early Prose and Poetical Works* (London, 1888).

TAYLOR, JOHN (1750–1824). An American legislator and writer, born in Virginia. He graduated at William and Mary College in 1770, and was a member of the United States Senate from 1792 until 1794, for two months in 1803, and from 1822 until his death. In 1798 he moved in the House of Delegates the "Virginia Resolutions." (See VIRGINIA AND KENTUCKY RESOLUTIONS.) He published: *An Inquiry into the Principles and Policy of the Government of the United States* (1814); *Aratos: being a Series of Agricultural Essays, Practical and Political* (6th ed., 1818); *Construction Construed and the Constitution Vindicated* (1820); *New Views of the Constitution of the United States* (1822). *Disunion Sentiment in Congress in 1794* was published in 1905. In his works he was an advocate of strict construction of the Constitution.

TAYLOR, JOHN (1808–87). The successor of Brigham Young (q.v.) as president of the Church of Jesus Christ of Latter-Day Saints. (See MORMONS.) He was born at Winthrop, England, became a Methodist local preacher, and emigrated to Canada in 1829. In 1836 he joined the Mormon church and was elected one of the Twelve Apostles. At the assassination at Carthage of Joseph Smith, Jr. (q.v.), he was himself wounded, but was one of those who counseled the Mormons to keep the peace. Opposing the claims of Sidney Rigdon (q.v.) to the headship of the church, he started with the first emigrants for the Salt Lake valley. Appointed to the European mission, he was active in Britain and France for several years and published a Mormon monthly in Paris and translated the *Book of Mormon* into French and German. Returning to America in 1852 he was stationed in New York in 1854 as superintendent over the eastern churches and there published. the *Mormon.* Having served as associate justice of the inchoate State of Deseret, as a probate judge of Utah County, and a member of the Utah Legislature, in 1858 he was indicted for treason against the United States government. On Oct. 6, 1880, he was elected president of the Mormon church. He was a firm believer in polygamy, for which he was indicted in 1885, afterward fleeing to avoid criminal prosecution and living in seclusion until his death.

TAYLOR, JOHN LOUIS (1769–1829). An American jurist, born in London, England. He removed to Fayetteville, N. C., and was admitted to the bar. From 1792 to 1794 he was a member of the State Legislature, in 1798 was elected a judge of the Superior Court, and was Chief Justice of the Supreme Court from 1808 until his death. In 1817 he was appointed a commissioner for the revision of State statutes, the work being published in 1821. His publications include: *The North Carolina Law Repository* (2 vols., 1814–16); *Term Reports* (1818); and *On the Duties of Executors and Administrators* (1825).

TAYLOR, JOSEPH (?1586–?1653). An English actor, mentioned in the Shakespeare folio of 1623 as one of those who appeared in Shakespeare's plays. His Hamlet, which he acted after Burbage, is interesting on account of the tradition that Shakespeare himself trained him in the part. At different times he was a member of the company at the Globe Theatre and elsewhere, and later in life he was appointed to the government office of Yeoman of the Revels. Consult Collier, *Memoirs of the Principal Actors in the Plays of Shakespeare* (London, 1846).

TAYLOR, LAURETTE (*née* COONEY) (1887–). An American actress, born in New York City. She was married to Charles A. Taylor, and later to J. Hartley Manners (q.v.). Having made her first appearance on the stage while a child, she toured and for a time played in stock at Seattle, Wash., and in 1909 appeared in New York in *The Devil.* In 1912 she achieved a great success as Luana in *The Bird of Paradise.* Miss Taylor became best known in the Irish comedy rôle of Peg in her husband's play, *Peg o' My Heart,* which ran more than 600 performances in New York in 1912–14 and later more than 500 in London. During the same period she starred in a sketch by her husband called *Happiness.*

TAYLOR, NATHANIEL WILLIAM (1786–1858). An American Congregational theologian. He was born at New Milford, Conn.; graduated at Yale College in 1807. He studied theology five years with Dr. Dwight and was ordained pastor of the First Church (Congregational), New Haven, in 1812, as successor of Moses Stuart. In 1822 he was elected Dwight professor of didactic theology in Yale College, and held the position till his death. In 1828 he preached in New Haven the *concio ad clerum,* presenting views on native depravity which were denounced as heretical, and led to the founding of what later became Hartford Theological Seminary, in opposition to his views. Dr. Taylor modified the New England theology (q.v.) in the direction of a recognition of free will. After his death, four volumes of his works were edited by President Noah Porter: *Practical Sermons* (1858); *Lectures on the Moral Government of God* (1858); *Essays, Lectures, etc., upon Select Topics in Revealed Theology* (1859). His *Life* was published at New Haven in 1858. Consult F. H. Foster, *Genetic History of New England Theology* (Chicago, 1907).

TAYLOR, PHILIP MEADOWS (1808–76). An Anglo-Indian officer and novelist. He was born in Liverpool, England, and when 15 years old went to India to enter commercial life in Bombay, but instead received a commission in the Nizam of Hyderabad's army. In 1841 he was commissioned to pacify the State of Shorapore and was appointed administrator during the minority of the ruler, satisfying in this both the natives and the British government. After the Raja's accession he was appointed administrator of the ceded districts in the Western Deccan, his rule during the perilous time of the Mutiny being eminently successful. He returned to England in 1860 and in 1869 was made a Companion of the Star of India. Besides his brilliant administrative services Taylor was widely known by his popular novels illustrative of stirring periods in the history of India; the chief of them are: *The Confessions of a Thug* (1839); *Tippoo Suttaun, a Tale of the Mysore War* (1840); *Tara, a Mahratta Tale* (1863); *Seeta* (1872); and *A Noble Queen* (1878), the last two descriptive of the Indian Mutiny. Consult his autobiographical *Story of My Life* (London, 1877).

TAYLOR, RICHARD (1826–79). A Confederate soldier, familiarly known as "Dick" Taylor. He was the son of President Zachary Taylor, and was born at New Orleans. He graduated at Yale in 1845, and was for a time with his father in the Mexican War. He was a member of the Louisiana seceding convention, and later became colonel of the Ninth Louisiana Regiment. He was soon promoted to the rank of brigadier general; fought under Stonewall Jackson in the Shenandoah valley campaign, and then in the Seven Days' Battles before Richmond; was promoted to the rank of major general, and was put in command of Louisiana, the western part of which he recovered for the Confederacy. On April 8, 1864, he defeated General Banks at Sabine Cross Roads, and captured 22 guns and about 2500 prisoners, thereby making it necessary for the Federal general to give up the Red River expedition and to retreat. On the following day, however, Taylor himself sustained a severe repulse at Pleasant Hill. On May 4, 1865, he surrendered to General Canby. He published *Destruction and Reconstruction* (1879).

TAYLOR, ROBERT WILLIAM (1842–1908). An American physician. He was born at Coventry, England, but as a child came with his parents to New York. He was early a druggist, studying medicine during leisure and graduating from the College of Physicians and Surgeons in 1868. He then commenced practice in New York City and turned his attention to dermatology and venereal diseases, a field in which he soon became a leading surgeon. From 1891 to 1905 he held the chair of genitourinary and venereal diseases in the College of Physicians and Surgeons. He published various important papers and books on his specialty.

TAYLOR, ROWLAND (?–1555). An English martyr. He was born at Rothbury, Northumberland, and was educated at Cambridge, where he became principal of Borden Hastel about 1531. He was associated with Cranmer as domestic chaplain, and received in succession numerous ecclesiastical appointments. At Cambridge he had become acquainted with the Protestant manual *Unio Dissidentium* and was a firm believer in, and adherent to, its doctrines. As rector of the living of Hadleigh, Suffolk, to which he had been presented by Cranmer in 1544, he opposed the performance of mass by a priest in 1554, was imprisoned by order of Queen Mary, condemned to death, and on Feb. 9, 1555, was burnt on Aldham Common, near Hadleigh.

TAYLOR, SAMUEL COLERIDGE. See COLERIDGE-TAYLOR, SAMUEL.

TAYLOR, THOMAS (1758–1835). An English classical scholar known as "the Platonist." He was born of humble parents in London. He studied at St. Paul's School, taught school, and at length obtained a clerkship in a London bank. His spare time he gave to the study of chemistry, mathematics, and especially Greek philosophy; and soon after 1780 he began his lectures on Plato, Plotinus, and the Neo-Platonists. On receiving an annuity of £100 from a friend, he resigned his place in the bank and began translating and expounding the ancient classical authors, a work for which he was ill equipped. Among his translations are: *Plato* (1804); *Aristotle* (1806–12); *The Mystical . . . Hymns of Orpheus* (1787); *Apuleius; Celsus; Iamblicus; Julian; Maximus Tyrius; Pausanias; Plotinus; Porphyry;* and *Proclus*. Among his miscellanies are: *Vindication of the Rights of Brutes* (1792); *The Eleusinian and Bacchic Mysteries* (1790); and *Theoretic Arithmetic* (1816). Taylor enjoyed the friendship of Peacock, Romney, and Langton. He died at Walworth, London. He figures as a character in Isaac D'Israeli's novel *Vaurien*. Consult W. E. A. Axon, *Thomas Taylor, the Platonist* (London, 1890).

TAYLOR, SIR THOMAS WARDLAW (1833–). A Canadian lawyer and judge, born in Auchtermuchty, Scotland. He studied at Edinburgh University, and was admitted to the Upper Canadian bar in 1858. From 1872 to 1883 he was Master of Chancery, and from 1883 to 1887 puisne judge of the Manitoba Court of Queen's Bench. In 1887–99 he was Chief Justice of Manitoba, and in 1890 and 1893 was administrator of the provincial government. He made an extensive study of equity jurisprudence, on which subject he published a volume of *Commentaries* (1875). His further works include *Chancery Statutes and Orders* and *The Public Statutes Relating to the Presbyterian Church.*

TAYLOR, TOM (THOMAS PROCLUS) (1817–80). An English playwright and journalist, and editor of *Punch*, born at Bishop-Wearmouth, near Sunderland. After attending the University of Glasgow he entered Trinity College, Cambridge, where he was elected fellow of his college (1842). He tutored at Cambridge for two years and was then (1845) appointed professor of English literature in London University. He also studied law at the Inner Temple, where he was called to the bar in 1846. On the creation of the Board of Health in 1850, he became its assistant secretary and afterward its secretary. He began early to write for various London periodicals, but chiefly for *Punch*, of which he became editor in 1874. Much interested in art, he wrote biographies of Benjamin Robert Haydon (1853) and of Sir Joshua Reynolds (1865), and edited *Charles Robert Leslie's Autobiographical Recollections* (1860) and *Pen Sketches by a Vanished Hand* (1879), a collection of essays by Mortimer Collins. He also wrote or adapted more than a hundred dramatic pieces. In them he showed himself a great master of stagecraft. Among the most popular were: *Still Waters Run Deep* (1855); *The Overland Route* (1860); *'Twixt Axe and Crown* (1870); *The Ticket-of-Leave Man* (1863); and *Lady Clancarty* (1874). In *Masks and Faces* (performed in 1852) he collaborated with Charles Reade.

TAYLOR, WILLIAM (1765–1836). An English philologian, known sometimes as William Taylor of Norwich. He was born in Norwich, England. He became an enthusiast for the literature of Germany, and devoted most of his life to making it known to his countrymen. His finest production was a translation of Bürger's *Lenora* in ballad metre (completed 1790; published 1796), which led to Scott's version. He also translated Lessing's *Nathan the Wise* (1790; printed, 1805), Goethe's *Iphigenia* (1793), and some of Wieland's *Dialogues of the Gods* (1795). By this time he was writing on German literature extensively for the reviews.

These articles were collected under the title *Historic Survey of German Poetry* (3 vols., 1828–30). Though interesting for his many eccentricities, Taylor has a place in literary history as the first interpreter of German literature for England. He died at Norwich. Consult the *Memoir* by Robberds (London, 1843) and Herzfeld's valuable monograph, *William Taylor von Norwich* (Halle, 1897).

TAYLOR, William (1821–1902). An American Methodist Episcopal missionary bishop. He was born in Rockbridge, Va., and entered the Baltimore conference in 1843. A missionary to California in 1849, he organized the first Methodist church in San Francisco. Between 1856 and 1883 he traveled in many parts of the world as an evangelist. He was elected Missionary Bishop of Africa in 1884, and retired in 1896. He wrote: *Seven Years' Street Preaching in San Francisco* (1857); *Christian Adventures in South Africa* (1867); *Four Years' Campaign in India* (1875); *Our South American Cousins* (1878); *Self-Supporting Missions in India* (1882); *The Story of My Life* (1895); *Flaming Torch in Darkest Africa* (1898).

TAYLOR, William Ladd (1854–). An American illustrator, born at Grafton, Mass. He studied art in Boston and New York, and in Paris under Boulanger and Lefebvre in 1884–85. His drawings, many of which first appeared in magazines, are essentially narrative in type and show keen understanding of human nature, with careful, historical accuracy. Taylor published several volumes of his work, series illustrating the nineteenth century in New England, the pioneer West, Longfellow, the Psalms, old songs, American life, American literature, the Old Testament.

TAYLOR, William Mackergo (1829–95). An American Congregational minister. He was born at Kilmarnock, Ayrshire, Scotland, and graduated at the University of Glasgow (1849), and at the divinity hall of the United Presbyterian Church, Edinburgh (1852). He was pastor of churches in Britain till 1872 (for 17 years of one in Liverpool) and thereafter of the Broadway Tabernacle (Congregational), New York, till 1893, when he retired in consequence of a paralytic stroke. Besides biographies of Rev. Matthew Dickie (1872) and of John Knox (1885), he published numerous volumes of sermons and discourses, of which those of a biographical character on Joseph, Moses, David, Elijah, Daniel, Paul were very popular. He was editor of *The Christian at Work* (1876–80). He delivered the Lyman Beecher lectures at Yale in 1876, *The Ministry of the Word;* the L. P. Stone lectures at Princeton, *The Gospel Miracles in their Relation to Christ and Christianity* (1880); also published *The Scottish Pulpit from the Reformation to the Present Day* (1887). A brief memoir appeared in New York in 1895.

TAYLOR, Zachary (1784–1850). The twelfth President of the United States. He was born in Orange Co., Va., on Nov. 24, 1784, and was the son of Col. Richard Taylor, an officer of the Revolutionary War and one of the first settlers of Louisville, Ky., whither Zachary was taken in early childhood, and where he lived until his twenty-fourth year, working on a plantation and receiving only an elementary education. His elder brother, who had received a lieutenancy in the army, died in 1808, when Taylor was appointed to the vacant commission. In 1810 he was promoted to a captaincy; and in 1812, with 50 men, two-thirds of whom were ill of fever, he defended Fort Harrison, on the Wabash, against a large force of Indians led by Tecumseh. Promoted to the rank of major for his gallantry, he was employed during the war in fighting the Indian allies of Great Britain. In 1822 he built Fort Jesup. With headquarters at Fort Crawford, Prairie du Chien, Wis., from 1832 to 1836, Taylor served as colonel in the Black Hawk War and later as Indian agent at Prairie du Chien. In 1836 he was ordered to Florida, where he gained an important victory over the Seminole Indians at Okeechobee, for which he was appointed brigadier general, and was made commander of the United States forces in Florida. In 1840, having been appointed to the command of the Southwestern Department, he purchased a plantation near Baton Rouge, La. On Feb. 28, 1845, Congress passed the resolution for the annexation of Texas, formerly a province of Mexico, and for some time an independent republic. Texas claimed the Rio Grande for her southwestern boundary; Mexico insisted that there could be no claim beyond the Nueces, and prepared to defend the disputed territory, even if she could not reconquer the whole of Texas. General Taylor was ordered to Corpus Christi. This point he occupied in November with a small force which was increased by reënforcements to 4000 men. On March 28, 1846, he had moved to the Rio Grande, across the disputed territory, and had begun to build Fort Brown, opposite and commanding the Mexican port of Matamoros. General Ampudia, the Mexican commander, on April 12, demanded that he should retire beyond the Nueces, pending negotiations; and on the refusal of General Taylor, his successor, General Arista, crossed the Rio Grande with a force of 6000 men and 10 pieces of artillery. On May 8 he was defeated at Palo Alto by General Taylor, with a force of 2300; and on the next day was driven from a new position at Resaca de la Palma across the Rio Grande. War was declared first by the President, and later by Congress, to exist by the act of Mexico; and 50,000 volunteers were called for. Taylor was made major general, was reënforced, and ordered to invade Mexico. On September 9, with 6600 men, he attacked Monterey, which was defended by about 10,000 regular troops. After ten days' siege and three days' hard fighting it capitulated. General Scott, having been ordered to advance on the city of Mexico by Vera Cruz, withdrew a portion of the troops of General Taylor, leaving him only 5000 volunteers and 500 regulars, chiefly flying artillery, to meet an army of 20,000, commanded by Santa Anna. He took a strong position at Buena Vista, fought a desperate battle on Feb. 22 and 23, 1847, and won a decisive victory. (See Mexican War.) This victory, against enormous odds, created the utmost enthusiasm. General Taylor, popularly called "Old Rough and Ready," was nominated by the Whigs in 1848 for President of the United States, and was elected, receiving 163 electoral votes, while General Cass, the Democratic candidate, received 127 electoral votes, and Martin Van Buren, the Free Soil candidate, received none. Entering upon the presidency in 1849, he found a Democratic plurality in Congress, with a small but vigorous Free Soil party holding the balance of power, while the most exciting questions connected with the extension of slavery, as the admission of California, the settlement of the boundaries of Texas, the organization of the other newly acquired Mexican territories, etc., were agitating the country and threatening a disruption. On July 4, 1850, 16 months after his inauguration, he was attacked with bilious colic and died on the 9th. Consult: H. O. Ladd, *The War with Mexico* (New York, 1883); O. T. Howard, *General Taylor* (ib., 1892); J. F. Rhodes, *History of the United States* (ib., 1910); J. G. Wilson, editor, *Presidents of the United States, 1789–1914*, vol. ii (ib., 1914).

TAY'LORVILLE. A city and county seat of Christian Co., Ill., 26 miles southeast of Springfield, on the Wabash, the Chicago and Illinois Midland, and the Baltimore and Ohio Southwestern railroads (Map: Illinois, F 6). It has a Carnegie library, St. Vincent Hospital (Roman Catholic), and a fine courthouse. Taylorville is surrounded by a productive region engaged in farming, stock raising, and horse breeding, and has two large coal mines and an iron foundry. Paper, chemicals, brick, tile, wagons, bags, and agricultural implements constitute the principal manufactures. Pop., 1900, 4248; 1910, 5446.

TAYRA, or **TAIRA**, tī'rȧ (South American name). A plantigrade, weasel-like carnivore of Central and South America (*Galictis barbara*), closely allied to the grisons (q.v.). It is about three feet long, nearly half of this belonging to the bushy tail; dark brown above, yellowish below; preys upon small animals, and often gathers into small bands which hunt in company, usually in the early morning.

TAYTAY, tī-tī'. A pueblo and the chief town of the Province of Paragua, Palawan Island, in the Philippines; situated in the southwest angle of the bay of the same name in the northeast part of the island. The Bay of Taytay is about 11 miles long and 6 miles wide, and affords good shelter in the southwest monsoon. There is a fort with walls 30 feet high and accommodations for 700 men. In the neighborhood of the town are large tracts of cultivated ground. Pop., 1903, 4992.

TA YÜ. See Yü.

TAYUG, tȧ-yōōg'. A town of Luzon, Philippines, in the eastern part of the Province of Pangasinán, situated 28 miles east of Lingayén. Pop., 1903, 10,400.

TAZE'WELL, Littleton Waller (1774–1860). An American political leader, born at Williamsburg, Va. He graduated at William and Mary College in 1792; was admitted to the bar in 1796; was a member of Congress in 1801–03; and then devoted himself to the practice of law. From 1824 until 1833 he was a member of the United States Senate. As a member of the Committee on Foreign Relations he wrote the famous report on the Panama mission. He opposed most of the acts of Adams and of Jackson; was an enemy to the policy of protection; denounced nullification, but was not in sympathy with Jackson's method of suppressing it; and attacked the administration for removing the United States Bank deposits. In 1834 he was elected Governor of Virginia, and after one term withdrew from public life. His principal published work is *Review of the Negotiations between the United States and Great Britain Respecting the Commerce of the Two Countries* (1829).

TCHAADAEV, chä-dä'yôf, Petr (Piotr) Yakovlevitch (1794–1856). A Russian writer, born at Moscow. On graduation from Moscow University (1812) he entered the army and served in the Napoleonic wars. The main thesis of his famous *Philosophical Letters*, the first of which appeared in 1836 in the Moscow *Telescope*, was that Russia had lagged behind Western countries and had contributed nothing to the world's progress. He therefore concluded that Russia must start de novo. These strikingly uncomplimentary views caused their author to be adjudged insane, and his next work was entitled, fittingly, *The Vindication of a Madman* (1837). In this brilliant but uncompleted work he maintained that Russia must follow her inner lines of development if she was to be true to her historical mission. The Slavophils at first mistook Tchaadaev for one of them, but later, on realizing their mistake, bitterly denounced and disclaimed him. Tchaadaev really fought Slavophilism all his life. Most of his works have been edited by his biographer, M. Gershenzon (2 vols., Moscow, 1913–14), whose excellent little study of the philosopher was published at St. Petersburg in 1908.

TCHAD. A lake of Central Africa. See Chad.

TCHAIKOVSKY, chī-kôf'skĭ, Nikolai Vasilevitch (1850–). A famous Russian revolutionist. He was born in the Province of Saratov and studied natural science, especially chemistry, at St. Petersburg University. Subsequently he interested himself in the labor movement and became a prominent revolutionary leader. To study the labor question in its international aspects he traveled much abroad. While in the United States he founded a commune, which, however, was short lived. After the revolutionary events of 1905–06, Tchaikovsky returned to Russia and subsequently resided in London.

TCHAIKOVSKY, Peter Ilyitch (1840–93). The greatest composer Russia has thus far produced, born at a small place called Votkinsk, in the Ural mining region, on May 7, 1840. He studied jurisprudence in St. Petersburg, and in 1859 obtained a position in the Ministry of Justice. In company with a young poet named Apukhtin, who greatly influenced his future, he listened to Italian opera whenever an opportunity presented itself. This love of Italian music left its traces in Tchaikovsky's scores. He entered the conservatory, where Anton Rubinstein, its director, was attracted by the young man's ability. Tchaikovsky resigned his government position, studied music with all the vigor of his nature, and, on his leaving the conservatory three years later, he continued to study orchestration with Rubinstein and took up the flute, piano, and organ. In 1866 he accepted the position of teacher of harmony at the Moscow Conservatory. It was at this time that he met the poet Ostrovsky, who gave him the libretto for his first opera, *Voyevoda* (The Chieftain).

Tchaikovsky's first musical idols were Glinka, the father of modern Russian music, and Mozart. He venerated Beethoven and admired Schumann, but, singularly enough, he never cared much for Chopin. Schumann, with his short-breathed phrases, was the Russian's model in writing for the pianoforte. Tchaikovsky went on composing, undeterred by the lack of appreciation on the part of both the Rubinsteins. Even the brilliant and effective first piano concerto was picked to pieces by Nicholas, and so hurt was the young composer that he erased the dedication to Nicholas and substituted the name of Hans von Bulow, who rewarded the courtesy by producing the concerto in Boston on the occasion of his first visit to America (1875–76). Tchaikovsky made the acquaintance of Balakireff, who urged him to compose the *Roméo et Juliette* fantaisie overture. Now flowed forth a stream of songs, symphonic poems, concertos, symphonies, operas, chamber music, overtures, dances, many experimental in form, much that was mediocre and also some genuine masterpieces. An unhappy marriage, briefly endured, sent him into a retirement at Klin, which was occasionally interrupted by trips to Germany, France, Italy, Switzerland, and England. He met Brahms and liked the man, but never concealed an antipathy for his music. He admired Wagner, with many reservations, though he willingly visited Bayreuth. But he took no great interest in the music drama, preferring old-fashioned operatic forms. All his opinions, musical and otherwise, may be found in his *Diary*, and in his musical criticisms, which were edited by G. A. Laroche. His fame grew apace, and in the spring of 1891 he visited America, in response to the invitation of Walter Damrosch, and was present at the dedication of Carnegie Hall, New York. On Nov. 6, 1893, Tchaikovsky died in St. Petersburg, after a short illness, of cholera. His death evoked universal sympathy, and Russia learned from the western world that she had lost her greatest composer.

For many years the opposition to Tchaikovsky was based upon the allegation that he was not really one of the Neo-Russian nationalists, who with Tolstoy "went to the people" for their themes. Tchaikovsky, like Turgenev, was a traveled man of culture, and a cosmopolitan on certain sides of his art; but there was no truer patriot than this fiery-souled poet, who demonstrated his slavophilism in a hundred of his compositions. His happiest work is in the pure fantasy, or what he was pleased to term "overture fantaisie." Thus his *Manfred, Roméo et Juliette, The Tempest*, and *Francesca da Rimini* give us Tchaikovsky at the very height of his powers. The unfailing invention which marks his poetic works seemed to desert him when he attempted absolute music. A poet first, musician afterward, Tchaikovsky was inspired by a definite programme. He was a born master of orchestration. The *timbres* of his instruments meant for him so many voices, and so his works are often tone dramas, operas without words. Tchaikovsky's music reveals the mighty pessimism of his nation. His symphonies are often built upon typical phrases, taken from the folk song; he is Russian in his operas, with their national texts and treatment. Some of his songs —he wrote over a hundred—are masterpieces. His Florentine string sextet is warm in color, and in his three string quartets he often strays across the borders into the pleasing country of the operatic. The world has come to recognize the last movement of the *Pathetic* symphony as an unparalleled embodiment of woe. The fifth symphony is more homogeneous; the fourth, in F minor, more Russian. There are three piano concertos, a violin concerto, and many exquisite piano pieces. The three great symphonies (4, 5, 6), the symphonic overtures, with their wealth of musical imagery, their dramatic power and thrilling effects, constitute Tchaikovsky's claim to immortality. He had a predilection for ballet music and left charming specimens of dance music in *Le cassenoisette* suite and other compositions in a light vein. His operas are seldom heard outside of Russia. *Pique Dame* (1890), immensely popular in Russia, is the only one of Tchaikovsky's ten operas ever produced in the United States (Metropolitan Opera House, 1910), and failed to impress. *Eugene Onegin* (1879), no less popular in Russia than the just-mentioned opera, had two complete performances in America in concert form (New York, 1908, 1911), but its reception was not such as to warrant the expense of scenic production. Besides these, the *Voyevoda* (1869), *The Maid of Orleans* (1881), *Mazeppa* (1882), and *Iolanthe* (1893) met with success in Russia. Other noteworthy works include the incidental music to the lyric drama *Snowdrop;* three ballets, *Le lac des cygnes; La belle au bois dormant* (1890); and *Le cassenoisette;* symphonies, and a great mass of miscellaneous compositions. He published a *Treatise on Harmony* (1872); a translation of Gevaert's *Traité d'instrumentation* (1866); and also wrote *Musikalische Erinnerungen und Feuilletons* (1899). A complete thematic catalogue of the composer's works was published by P. Jurgenson at Moscow (1897).

Consult: Iwan Knorr, *Tschaikovsky* (Berlin, 1900); E. M. Lee, *Tchaikovsky* (London, 1904); Modest Tchaikovsky, *Das Leben Peter Ilyitch Tchaikovsky's*, translated from the Russian by Paul Juon (2 vols., Leipzig, 1900–04); the same translated and abridged by Rosa Newmarch as *The Life and Letters of Peter Ilyitch Tchaikovsky* (London, 1905); E. Evans, *Tchaikovsky* (ib., 1906); Rosa Newmarch, *Tchaikovsky, his Life and Works* (ib., 1908).

TCHAKA. See Zululand.

TCHEKHOV, Anton Pavlovitch. See Chekhov.

TCHELIABINSK, chĕl-yȧ-bĭnsk′. An important district town in the Government of Orenburg, east Russia, 363 miles northeast of Orenburg (Map: Russia, K 3). As the western terminus of the Trans-Siberian Railway the town has considerable commercial importance. On its outskirts are special barracks for Siberian emigrants, of whom 267,000 passed in 1913. Pop., 1910, 70,472.

TCHELYUSKIN, chĕl-yōōs′kĭn, Cape. See Severo Cape.

TCHENSTOCHOW. See Chenstochow.

TCHER′EMIS′SES. A Finnish tribe of eastern Russia, living in the region on the left bank of the middle Volga—Vyatka, Kazan, and the adjoining governments. They number about 375,000. Their average height is 1.61 meters, the cephalic index 79. In general, they have red hair and a full beard of the same color; their eyes are sunken and of blue, greenish, or chestnut shade; the complexion is fair and freckled, the cheek bones prominent, the face and lips thin, the chin round, and the nose straight. Some authorities believe that they received through the Bulgarians the Tatar influences displayed in their social life, their houses, costumes, social organization, and religious ideas. They believe in evil and good gods, and in spirits of the dead which they worship with peculiar rites. They have also many magical rites to ward off the evil influences of the spirits of the wood, river, and snow and to keep the ghosts of the dead in their graves. Consult Smirnov, *Mordves et Tcheremisses* (Paris, 1895).

TCHERKASK, Novo-. See Novo-Tcherkask.

TCHERKASSY, chĕr-käs′sê. A district town in the Government of Kiev, South Russia, situated on the Dnieper, 126 miles southeast of Kiev (Map: Russia, D 5). It trades in grain, tobacco, and sugar. Pop., 1910, 39,649.

TCHERKESSES. See Circassians.

TCHERNAYA, chĕr-nä'yȧ. A small river in the Crimea, Government of Taurida, South Russia, flowing into the Black Sea near Sebastopol. On Aug. 16, 1855, a Russian army advancing to the relief of Sebastopol was defeated by the allies with heavy loss on the banks of the Tchernaya.

TCHERNAYEV, chĕr-nä'yĕf, Mikhail Grigorievitch (1828–98). A Russian general. He entered the army in 1847, fought in the Crimean War and in the Caucasus and went to Turkestan in 1864 as major general and captured Tashkent. He had made an unsuccessful attempt on this town the year before. He left the army in 1867, commenced the practice of law at Moscow, and became an ardent advocate of Panslavism (q.v.). In 1876 he received the command of the Servian army on the Morava, and was defeated by the Turks at Alexinatz, October 29. In 1879 he tried to organize a revolution in Bulgaria and was sent as prisoner to Adrianople and thence brought to Russia. From 1882 to 1884 he was Governor-General of the Military Department of Tashkent in Turkestan.

TCHERNIGOV, chĕr-nē'gôf. A government in southwest Russia. Area, 20,233 square miles (Map: Russia, D 4). The surface is level, and in the north marshy. It is watered by the Dnieper and the Desna. The chief occupation is agriculture and the principal products are rye, buckwheat, potatoes, wheat, and tobacco. Stock raising is also important. There is an abundance of porcelain clay, which is used extensively for the production of porcelain ware; woodenware is also largely manufactured. There are a number of sugar refineries and distilleries. Pop., 1912, 3,083,500, consisting largely of Little Russians. Capital, Tchernigov (q.v.).

TCHERNIGOV. The capital of the government of the same name, in Russia, situated on the Desna, 476 miles southwest of Moscow (Map: Russia, D 4). Almost all the trade and commerce of the government is concentrated in this city. It has two cathedrals, dating from the eleventh and the twelfth centuries, and remains of an old castle. Pop., 1910, 32,848. Tchernigov rose to political and commercial importance as early as the eleventh century, but, falling into the path of the Tatar invasion, it lost much of its prominence.

TCHERNYSHEV, chĕr'nĭ-shĕf, Alexander Ivanovitch, Prince. See Chernyshev.

TCHERNYSHEV, Theodosei Nikolaievitch (1856–1914). A Russian geologist. After his studies at a naval academy and a school of mines, he made a geological map of the western slope of the Ural Mountains. By 1903 he had become director of the Russian Geological Committee, many of whose annual expeditions to the Urals he superintended. Later he was placed in command of an expedition to northern Russia, made geological studies of the Donetz basin, explored Nova Zembla, and headed an expedition to determine the meridian line of Spitzbergen. Most of Tchernyshev's published work, including several monographs which brought him the highest prizes from scientific societies, is embodied in the proceedings of those societies.

TCHERNYSHEVSKY, Nikolai Gavrilovitch. See Chernyshevsky.

TCHERTKOV, chĕrt'kôf, Vladimir (1854–). A Russian writer, born in Moscow. He was an officer in the Russian Imperial Life Guards in 1874–81; was a magistrate in South Russia; and organized schools and self-help among the peasants. Tchertkov founded a publishing enterprise called Posrednik for distributing the best literature among the people; circulated private editions of Tolstoy's works; and disseminated information about the government's persecution of the Sectarians. For publishing an appeal in behalf of the Doukhobor sect, which was then being exterminated by the government, he was exiled in 1897, and thereafter lived in England, where he became editor of the Free Age Press publications. He published *Christian Martyrdom in Russia* (1897; 2d ed., 1900) and *A Short Biography of William Lloyd Garrison* (1904), with Florence Holah.

TCHETCH'EN, or **CHECHEN.** One of the eastern groups of the peoples of the Caucasus, dwelling between the Kabards and Lesghians (cephalic index, 84.5). They number some 300,000 and comprise the Tchetchens proper, Ingushes, Itchkerians, and Kists (q.v.). They call themselves Nakhtche, or "people." They are one of the most primitive peoples of the Caucasus, and in their mountain fastnesses even now resist Russian conquest. Their religion seems to be Islamism imposed upon an earlier crude form of Christianity with a heathen background. By language they rank as an independent stock.

TCHIAM. See Indo-Chinese.

TCHICHAGOV, Pavel Vassilievitch. See Chichagov.

TCHIGORIN, chĭg'ō-rĭn, Michael (1850–1908). A Russian chess master, born in St. Petersburg. He was engaged for a time in the Russian civil service, but early became interested in chess, and at the Berlin tournament of 1881 increased his local fame as an expert by following Blackburn and Zukertort in the list of victors. He was defeated by Steinitz at Havana in 1889, although two years afterward he won two cable matches. In 1892 he made an unsuccessful attempt to win the world's championship. At the Moscow tournament of 1899 he won first prize, divided the first honors in 1900 at the National Russian Tournament, and was third in the International Masters' Tournament held at Monte Carlo in 1901, and first in the Masters' Tournament at St. Petersburg in 1904.

TCHIKHACHEV, Peter Alexandrovitch. See Chikhachev.

TCHING-PAO. See Newspaper.

TCHIRIKOV, chē'rē-kôf, Yevgeny (1864–). A popular Russian writer, born in the Province of Simbirsk. His reputation dates from 1893, when he began to write for prominent monthlies. Thereafter he was a prolific writer of stories, sketches, plays, and novels. His noteworthy fiction includes *The Foreigners*, *The Invalids*, *Faust*, *The Rebels*, *In the Folds of Passion*, and *The Life of Tarkhanov* (3 vols., 1914). His plays, popular in Russia, include *For Fame*, *Ivan Mironytch*, *Congenial Friends*, *The Peasants*, *Maria Ivanovna*, and *The Jews*. Tchirikov's special field is the sombre life of the provinces. As a realist he belongs to the school of Kuprin and Korolenko.

TCHIRPAN. See Cirpan.

TCHIRSK, Nizhni. See Nizhni-Tchirsk.

TCHISTOPOL, chēs-tō'pôl. A district town in the Government of Kazan, Russia, situated on the Kama, 90 miles southeast of Kazan (Map: Russia, H 3). It has flour mills, distilleries, and cotton mills, and is the chief grain port on the river Kama. Pop., 1910, 24,921.

TCHISTOPOL. A district in the Government of Kazan, east Russia (Map: Russia, H 3). Its area is 3592 square miles. The principal industries are the raising of cereals, flax, and hemp, and the curing and manufacture of leather. Pop., 1912, 387,500.

TCHITA, chē'tä. The capital of the Territory of Transbaikalia and an important centre of east Siberia, on the Tchita River and the Trans-Siberian Railway, 532 miles by rail east of Irkutsk (Map: Asia, N 3). Pop., 1897, 11,480, largely Buriats.

TCHORLU, chôr'lōō. A town of the Vilayet of Rodosto, in European Turkey, on the Tchorlu River, a tributary of the Ergene, 20 miles northeast of Rodosto (Map: Balkan Peninsula, F 4). There are Christian churches and mosques. Wine and fruit are produced; native carpets and woolen cloth are manufactured. Pop., about 11,500. Tchorlu was the scene in November, 1912, of a Bulgarian victory over the Turks in the Balkan War (q.v.).

TCHUKTCHI, chōōk'chē, or **CHUKCHI** (from *cháwtcy*, rich in reindeer). A people living in the extreme northeast of Asia, numbering some 15,000. The reindeer Tchuktchi dwell in the interior about the Kolyma River; the sea (or fishing) Tchuktchi, who form the great majority, inhabit the coast of the Arctic from Bear Island to East Cape, while on the Pacific side they have mingled with the Eskimo. They are tall, well built, rather light-skinned, decidedly brachycephalic in part (there seem to be two physical varieties among them), and differ somewhat in form and features from the typical Mongolians, with whom they are allied by speech. Besides an interesting Shamanism, the Tchuktchi have a wealth of folklore and mythology not without traces of Eskimo influence. The old men commit suicide with great ceremony. See Borgoras, *The Chukchee* (Leyden, 1904). See GILIAKS.

TCHUST, chōōst. A town in the Territory of Ferghana, Russian Turkestan, 110 miles northeast of Khokand (Map: Persia, O 2). The natives manufacture knives and saddles. Pop., 1897, 13,686.

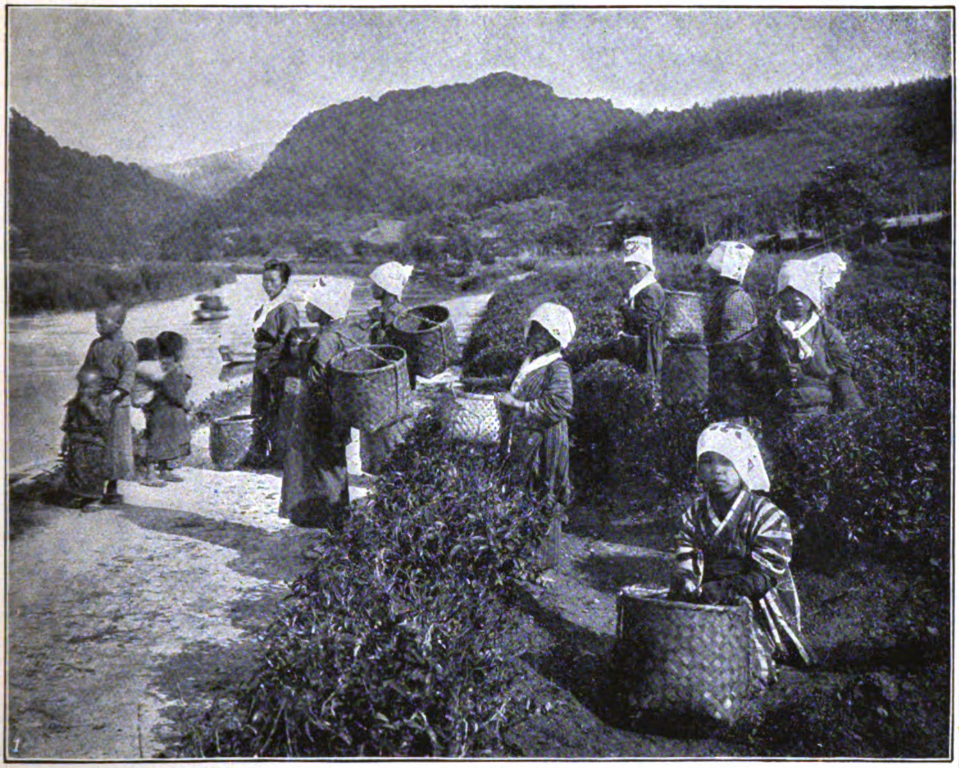
TCHUVASHES, chōō-väsh'ĕz. A people of eastern Russia, probably of Finnic (Tcheremissian) origin, and now with a strong Tatar admixture. Their seat is near the Volga and they number some 850,000. Their language, which is distinct, is assigned to the Ural-Altaic (q.v.) stock. They are industrious and orderly, their chief occupations being agriculture and cattle breeding. The Tchuvashes are nominally Christians, but more primitive Shamanistic beliefs and practices are still prevalent among them. Consult Schott, *De Lingua Tschuwaschorum* (Berlin, 1841).

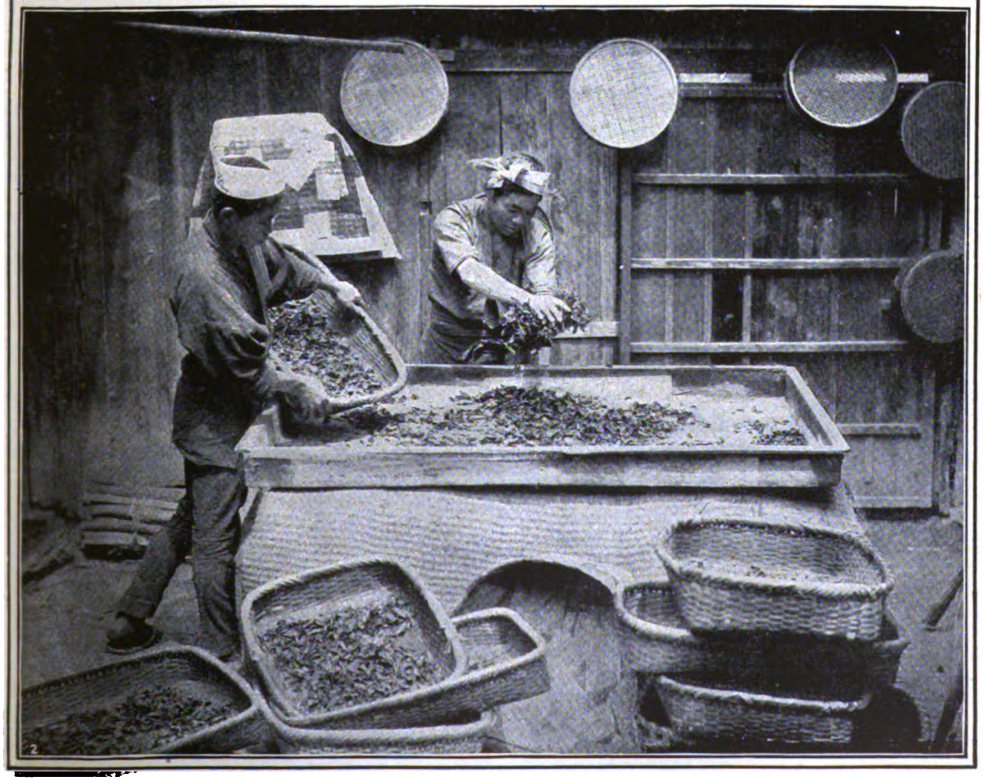
TEA (from Fuhkien Chin. *te*, Chin. *ts'a*, *ch'a*, tea). *Thea sinensis* (Camellia Thea) is a small tree, reaching a height of about 30 feet in the tropical parts of Assam, where it is probably native. The young leaves when properly handled become the tea of commerce. In order to increase the leaf production under cultivation, the plant is pruned to the form of a much branching shrub, from 2 to 5 feet high. Propagation is usually from seed sown in the fall in especially prepared shaded seed beds. In from one to two years the seedlings are large enough to transfer to the field. About three years after planting, the tea bush is large enough to give a small yield, which increases until the full crop is obtained after a period of from five to ten years from the seed. The garden when established yields tea for 50 years or more. When the yield falls, more or less severe pruning is resorted to. This also keeps the leaves within easy reach of the pickers. Tea has been cultivated in China and Japan since the dawn of history and in India and Ceylon since 1865. It requires a heavy rainfall, thriving best in a rainfall of 90–200 inches. In dry climates the "flushes" do not occur often enough.

TEA (*Thea sinensis*).

Although the tea plant is an evergreen, its leaves are used for tea only during "flushes" in which active growth takes place. Leaves are picked from 10 to 25 times a year in Formosa or every 10 or 12 days in Ceylon. Only the tip of the shoot or one or two of the youngest leaves are taken. A few older and coarser leaves go into the cheaper grades of tea. The tender upper leaves and terminal buds are picked by hand, according to one of several systems of plucking, and subjected to a complicated series of processes before the tea of commerce is produced. Formerly nearly all the work of manufacturing tea was done by hand, but in more recent times the use of machinery has greatly increased, saving personal contact and reducing expense.

The difference between green and black tea is largely due to the method of manufacture, although the leaves of some varieties of tea lend themselves more readily to the manufacture of black or fermented tea than others. It has been shown recently that certain oxidizing ferments, oxidases, present in the tea leaf, acting on other substances present in the fresh leaf, produce in the presence of air a series of reddish substances which alter both the taste and the appearance of the tea so as to produce the black tea of commerce. In making green tea the freshly plucked leaves are treated to a degree of heat high enough to destroy the oxidizing ferments (about 250° F.), and to give to the leaf a thoroughly limp and wilted appearance. This leaf is then rolled by hand, or in large machine rollers, holding from 50 to 150 pounds of tea





1. THE LAST PICKING.

2. DRYING THE LEAVES IN A TEA-HEATER.

at a time. The rolling gives the twisted appearance to the leaf and brings the juices to the surface. The rolled tea then goes to the firing machine where it is heated for a proper time at a heat sufficiently high to drive off the water from the leaf and develop the substances giving fragrance to the tea. This fragrance was formerly supposed to be due to volatile oils present in the tea plant, a theory which has been proved erroneous. The tea, after firing, is stored in air-tight bins or containers until it is graded and packed for shipment or storage. In making black tea the use of heat prior to the final firing process is dispensed with. The fresh leaves are spread out in drying lofts until they have been rendered flaccid by the evaporation of moisture. They are then rolled as just described and spread out on tables in cool, well ventilated rooms to oxidize. The proper reddish appearance is obtained after an exposure of two to 10 hours in the air, when the leaf is again rolled and then fired.

Some leaves are longer and larger than others and, to obtain uniformity of appearance, the tea is put through a cutting machine, after which it is sifted and graded for the market. Sometimes it is desirable to scent the tea artificially. This is done by exposing the dried tea to the fresh blossoms of *Olea fragrans*, the sweet-scented olive, or *Aglaia odorata*, used especially in scenting of Formosa oolong teas. Still other flowers are used for this purpose. In some cases it is thought necessary for commercial reasons to improve the appearance of green teas artificially. This is done by facing the teas with finely powdered talc, Prussian blue, or other coloring agents. After a period of experimentation by private parties, notably by Dr. Charles U. Shepard, and by the United States Department of Agriculture, the culture and manufacture of tea has been established on a small scale in South Carolina. An excellent grade of tea of black, green, oolong, and other sorts, has been manufactured, and finds a ready market in the United States. New and improved machinery has been invented, and the ability of negro children to pick tea efficiently has been demonstrated. There is so much hand labor involved in picking the leaves, however, that it remains quite doubtful whether the Southern States can compete with Ceylon, Japan, and China in growing tea.

The largest importation of tea into the United States comes from Japan, including Formosa, China taking second place, India and Ceylon third. Japan and Formosa teas find their largest market in the United States. England and Russia are large consumers of black teas, the former country getting its supply chiefly from India and Ceylon, the latter from China. Some tea is grown by Russia in the Caucasus region. The total annual tea exports from the tea-producing countries are about 810,000,000 pounds. Ceylon alone has 400,000 acres of tea and exports 190,000,000 pounds annually. The tendency among tea consumers is decidedly towards the use of black tea. British India and Ceylon produce black teas almost exclusively. Some of the sorts of tea used in the United States are here enumerated: Chinese—Greens: Gunpowder sorts, Hyson sorts, Young Hyson sorts. Blacks: Congous, red leaf from south China and black leaf from north China, as well as Canton, Pekoe, and other sorts. Oolongs: including Amoy, Foochow, and other sorts. Scented teas of various sorts in limited amount. Indian (including Ceylon and Java)—Greens: colored sorts: Gunpowder, Imperial, Young Hyson, Hyson, etc. Uncolored sorts: Young Hyson, Hyson. Blacks: Pekoes, of various sorts and grades, Souchongs, and Congous. Japan and Formosa—Greens: By various methods of firing, as pan fired, basket fired, sun dried, etc. Oolongs: From Formosa, according to districts and treatment, also scented puchongs in small amount. See Tea Insects.

Consult: A. J. Wallis-Taylor, *Tea Machinery and Tea Factories* (New York, 1900); J. M. Walsh, *Tea Blending as a Fine Art* (Philadelphia, 1902); id., *Tea: Its History and Mystery* (ib., 1902); United States Supervising Tea Examiner, *Annual Report* (Washington, 1914 et seq.).

TEACH, or **THATCH,** Edward (?–1718). An Anglo-American pirate, popularly known as Blackbeard. He became widely known and feared for his robberies and atrocities throughout the West Indies and along the coast of Carolina and Virginia. At Pasquotank, N. C., in 1718, he was attacked by two small sloops under the command of Lieutenant Maynard of the British navy, and by a successful ruse led to board the vessels, when he with several of his men was killed. Consult C. Johnson, *Lives of the Pirates* (1724), and S. A. Ashe, "Our Own Pirates," in *The North Carolina Booklet*, vol. ii, no. 2 (Raleigh, 1902).

TEACHERS COLLEGE. An institution in New York City for the training of teachers and school administrators, and for study and research in the field of education, founded in 1888, and made a part of the educational system of Columbia University (q.v.) in 1898. The college is an integral part of Columbia University and is represented by its dean and faculty delegates, but maintains its separate corporate organization, with a board of trustees who assume the entire financial responsibility for its maintenance. The departments of instruction are history and philosophy of education; educational administration, psychology, and sociology; secondary, elementary, kindergarten, vocational, religious, and rural education; English, French, German, Greek, and Latin; history, biology, geography, and mathematics; household and industrial arts; music and speech; nursing and health; and physical education and science. No department undertakes work for which adequate provision is made in other faculties of the university. The college maintains a school of observation; the Horace Mann School, with kindergarten, elementary, and high-school departments. The college inaugurated the system of extension teaching now conducted by the university, and issues a number of educational publications. In 1912 the faculty was reorganized into two schools, the school of education, which was placed on a graduate basis, and the school of practical arts. The buildings, five in number, are valued at $2,551,000. The total registration in 1914–15 was 5110, including 870 in summer session, 1833 special students, 929 in the school of education, and 1070 in the school of practical arts. The Bryson Library contains 58,881 volumes.

TEACHERS' PENSIONS. In all European governments which supervise school systems and regulate the appointment of teachers, it is held that teachers, being officers of the state, are as such entitled to pensions. The systems vary in the different countries between contributory and noncontributory principles. Germany has fairly generally adopted the latter principle—the state bearing the whole expense of the pensions. France and England require contributions from their teachers. It is felt usually that under a noncontributory system salaries are either depressed or remain stationary longer than under the other system. Germany and France provide also for the widows and orphans of teachers.

Pension systems for teachers in the United States originated late in the nineteenth century in the form of teachers' mutual benefit associations, voluntary clubs paying little more than burial fees, and supported by assessments, entertainments, etc. By 1895 the States of Illinois, New York, and California, and the cities of Detroit, New York, and St. Louis, had provided for the aid of teachers' retirement funds by the use of public money. The city of Brooklyn adopted the contributory system by deducting 1 per cent a year from the teacher's salary. In 1905 the State Legislature, by amending the charter of the city of New York, created a teachers' pension system which was then generally regarded as the most advanced in America. Its later development, however, belied this promise, for in 1915 the fund was reduced so low that it was declared bankrupt, and in 1916 a new system was under consideration, formulated by a Commission on Pensions which was appointed in 1913 to consider all the pension systems of the city.

Interest in pensions for teachers as for other employees has but recently developed. This is evident by the fact that of the 21 State-wide systems in existence in 1916, 15 were established after 1910. The State-wide systems are Arizona, California, Illinois, Indiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New York, North Dakota, Rhode Island, Utah, Vermont, Virginia, and Wisconsin. Of these only Arizona, Maine, Maryland, New Hampshire, Rhode Island, and Virginia have adopted the noncontributory principle. All the others require contributions from teachers which vary in amount as do the time of service required and the amount of the pension. In addition to the above systems a number of States have permissive pension laws, e.g., Kansas, Kentucky, and Ohio, while in others city systems have been established under special laws, e.g., New York and Pennsylvania.

Pension systems in the United States labor under a number of disadvantages, the chief of these being ignorance of the social basis and the actuarial principles that should underlie them. The result is that a large number of systems must either prorate the promised benefit or else become bankrupt. The great need at present is for sound actuarial information on the whole subject, since the social basis is generally admitted. This latter rests on the recognition that teachers are not paid adequate salaries, that the ordinary avenues of commercial gain are closed to them, and that some system of superannuation is necessary in the interests of an efficient service. But what must yet be established is the relation of the pension to final salary, the responsibility for the contributions, length of service required, and age of retirement, together with some form of disability grant or insurance.

In 1916 the only system that gave promise of permanence was that of Massachusetts. Here the teachers were compelled to make annual contributions of from 3 to 7 per cent of their salaries with which a sum was accumulated out of which annuities are paid. The State collects and administers this fund, and when a teacher is retired after 30 years of service at the minimum age of 60, the amount of the annuity due is doubled by a grant of an equal amount from the State. The total sum may not be as large as those promised in other schemes, but at least has the elements of certainty.

For pensions to university teachers see under CARNEGIE FOUNDATION FOR THE ADVANCEMENT OF TEACHING which discusses the subject in its annual reports. Consult: C. W. Prosser, *The Teacher and Old Age* (Boston, 1913); United States Bureau of Education, *List of References on Teachers' Pensions* (Washington, 1914); New York City, Commission on Pensions, *Report* (New York, 1915); Massachusetts Teachers' Retirement Board, *Annual Report* (Boston, 1915).

TEACHERS' SALARIES. Competition of women, the temporary employment of men, the classification of teaching with menial services, the low requirements in many parts of the country, and the assumption that this work should be done for the love of it, have kept the wages of teachers in America at or below the point of bare subsistence. The larger cities and towns have adopted schedules of salaries dependent upon the teacher's merit, length of service, and grade of class taught.

In 1898 the New York State Teachers' Association appointed a committee to investigate the cost of living in the various cities in the State, and to compare the figures with the salaries paid to teachers. The committee tabulated what they regarded as legitimate living expenses. This tabulation, with slight variations, has since been used by the teachers' associations of many States in collecting estimates for the minimum salary that should be paid teachers in a given locality.

In New York it was decided that $600 per year was the proper living wage. Twenty-five dollars a year increase for meritorious service was provided. Promotion to higher grades brought higher wages. This schedule was adopted by the Board of Education in 1898. It is the first American schedule based upon a carefully computed estimate of the cost of living in the community. In 1899 a law amending the charter of the city of New York and forbidding the Board of Education to pay any teacher less than $600 per annum, the living wage, was passed. This law was in 1900 strengthened by the provision that a specific appropriation of four mills on every dollar of assessed valuation of the taxable property of New York City must be set aside each year as a fund from which the salaries of the teachers may be drawn. The New York City public schools thus illustrate these principles of a salary system: Legal compulsion that the Board of Education shall pay at least what were living wages in 1898; encouragement of permanent teachers by means of annual increase of payments; encouragement of merit by withholding from unprogressive teachers any increase after the fourth year; encouragement of teachers' study and professional growth by higher salaries for higher grades obtainable by examination; retention of men by salaries permitting the support of a family; protection of the salary fund by requiring a per centum appropriation each year.

Improvements of the detailed working out of these principles have been suggested. Living expenses have increased 30 per cent since these schedules were made. The Board of Education has the power to increase the schedules without limit other than those set by the money available.

Since the adoption of the living-wage schedule, California, Colorado, Indiana, Iowa, Kentucky, Maryland, Mississippi, Missouri, New Jersey, North Dakota, Ohio, Pennsylvania, Rhode Island, Utah, West Virginia, and Wisconsin have passed minimum salary laws forbidding school boards to pay teachers less than specified sums, while a few have regulated the maximum salaries for certain grades of certificates, e.g., New Mexico, North Carolina, and Texas. Some States, such as California, Nevada, and Utah, together with New York City, are required to pay equal salaries for equal services to men and women teachers.

As the cost of living varies to such an extent in different localities, no table of averages of teachers' salaries for the entire country is of value. The preceding table shows the average salary of teachers according to population of the cities.

POPULATION	Elementary teachers	Average salary	High-school teachers	Average salary
250,000 and over	34,618	$1,018	5,067	$1,746
100,000 to 250,000	9,817	791	1,896	1,216
50,000 to 100,000	9,393	688	1,655	1,069
25,000 to 50,000	9,335	641	1,941	1,009
10,000 to 25,000	12,272	602	2,581	897
5,000 to 10,000	9,948	533	2,342	795

Bibliography. *Report of the National Educational Association, on Salaries of Public School Teachers* (Winona, Minn., 1905); also C. W. Bardeen, *Teaching as a Business* (Syracuse, 1897); C. B. Dyke, *Economic Aspect of Teachers' Salaries* (New York, 1899); C. W. Eliot, *More Money for the Schools* (ib., 1903); William McAndrew, "Some Suggestions as to Teachers' Salaries," in *Education Review*, vol. xxvii (ib., 1904); G. C. Strachan, *Equal Pay for Equal Work* (ib., 1910); Boykin and King, compilers, *Tangible Rewards of Teaching* (Washington, 1914); Baldwin and Mohr, compilers, *Bibliography of Teachers' Salaries* (ib., 1914).

TEACHING OF THE TWELVE APOSTLES (Gk. *διδαχὴ τῶν δώδεκα ἀποστόλων*, *didachē tōn dōdeka apostolōn*), also called the DIDACHE. An ancient Christian document, written in Greek, probably between 120 and 150, of great value for the study of organization, belief, and worship in the early Church. It was found in 1873 by Bryennios (q.v.), Metropolitan of Nicomedia, in an eleventh-century manuscript in the Monastery of the Holy Sepulchre in Constantinople, and was published by him 10 years later. Modern editors include it, by general consent, among the Apostolic Fathers (q.v.). The *Teaching* was apparently compiled from earlier material, for use as a church manual. It contains a description of the Two Ways, one of life, the other of death, in the form of rules for Christian conduct. Whether or not this part of the *Teaching* was originally separate from the rest, it is evident that it was used in catechetical instruction to prepare converts for baptism. It appears in slightly different form in the Epistle of Barnabas. The second portion of the *Teaching* sets forth the proper observance of the rites of baptism and the Lord's Supper, with directions for their administration, and defines the office and duties of the Christian leaders, especially apostles, prophets, teachers, bishops, and deacons. Ceremonial and organization are alike extremely simple. The whole concludes with a paragraph announcing the speedy second coming of Christ and the final judgment.

The *Teaching* was held in high honor in the early Church, and is quoted by Clement of Alexandria as Scripture. It forms the basis of the seventh book of the *Apostolic Constitutions* (q.v.), and bears some literary relationship to the *Shepherd of Hermas* and perhaps to the *Apology* of Aristides. Most critics are inclined to attribute it to Syria or Egypt, but no decisive argument exists for either. By the fourth century the *Teaching* had taken its place definitely among the ecclesiastical as distinguished from the canonical books.

Bibliography. J. R. Harris, *The Teaching of the Apostles* (Baltimore, 1887, contains facsimiles of the manuscript); Philip Schaff, *The Teaching of the Twelve Apostles* (3d ed., New York, 1889); Krüger, *History of Early Christian Literature* (ib., 1897); T. C. Cruttwell, *Literary History of Early Christianity* (2 vols., ib., 1889, contains an English translation); Kirsopp Lake, *Apostolic Fathers*, in "Loeb Classical Library" (ib., 1912). The text will be found critically edited, in Funk, *Patres Apostolici* (2d ed., Tübingen, 1901).

TEAGUE, tēg. A city in Freestone Co., Tex., 126 miles north of Houston, on the Trinity and Brazos Valley Railroad. It is in a productive cotton-growing region, and has a cotton-oil mill and compress. Railroad repair shops are situated here. Pop., 1910, 3288.

TEA INSECTS. The tea plant is attacked by several injurious insects, as the fagot worm (*Eumeta carmerii*), one of the bagworms, whose larva carries a case made up of fragments of twigs and feeds upon leaves of the plant. The tea borer (*Zenzera coffeæ*) is the larva of a cossid moth; it bores into the stems of both coffee and tea plants. Three species of bark lice (*Aspidiotus theæ*, *flavescens* and *transparens*) also occur commonly upon tea, and the first named is one of the most serious enemies of the growing plant, very noticeable at the time of pruning. Three mites feed upon the leaves, one of them a red spider (*Tetranychus bimaculatus*), another the five-legged tea mite (*Typhlodromus carinatus*), closely related to the rust mite of the orange. It feeds upon the lower leaves. The yellow tea mite (*Acarus translucens*) feeds upon the buds and produces the condition called "sulky." Consult Watt, *The Pests and Blights of the Tea Plant* (Calcutta, 1898).

STICK-COVERED COCOON OF A FAGOT WORM.

TEAK, tēk (Malayan *tekka*, Tamil *tekku*, teak tree). Two kinds of timber, valuable for ship building and other purposes. Indian teak (*Tectona grandis*) belongs to the family Verbenaceæ; African teak or African oak (*Oldfieldia africana*) to the Euphorbiaceæ. The former is found in the mountainous parts of Malabar and other parts of southeastern Asia. The teak forests of India are mostly under governmental control and yield a considerable revenue. The usual practice is to girdle the trees and allow them to stand for two years to season thoroughly before felling. Teak has been introduced in some parts of India in which it is not indigenous. It is a beautiful tree, rising above all the other trees of the East Indian forests, sometimes attaining a height of 200 feet. Silk and cotton stuffs are dyed purple by the leaves. The timber, which will sink in water unless dry, is one of the most valuable produced in the East; it resembles coarse mahogany, is easily worked, strong, durable, and not liable to the attacks of insects. It is largely used for furniture, some of which is handsomely carved, and for shipbuilding, for which purpose it is exported. The teak generally grows rather in clumps in forests than in forests of itself. African teak is adapted to the same uses as the Indian teak, though it is not quite as durable. On account of the growing scarcity of teak timber other species are sought to supply the demand for similar material. Among substitutes are the timbers of *Sloetia sideroxylon*, *Parinarium oblongifolium*, and a tree locally known as ironwood. All are found in the Malay Peninsula and Dutch East Indies. Efforts have been made to grow Indian teak in Nigeria, and tests of timber from young planted trees have been highly satisfactory.

TEAL, tēl (connected with Dutch *teling*, teal, brood, *telen*, to breed, and perhaps with AS. *tilian*, Eng. *till*, OHG. *zil*, Ger. *Ziel*, object). One of a group of small beautiful fresh-water ducks, mostly in the genera *Nettion* and *Querquedula*. They are migratory, going to the tropics for the winter, and when in the United States are shy and silent, feeding chiefly at night on water plants, seeds, worms, and insects. They make their nests usually at some distance from water, and lay greenish, or in some species cream-colored, eggs. Species of these two genera are known in all parts of the world. The commonest North American species is the green-winged teal (*Nettion carolinense*). This fine bird is nearly the same as the common teal (*Nettion crecca*) of the northern parts of the Old World. About a dozen other species are met with in Asia, Africa, and South America, all favorites among gunners and epicures. The blue-winged teal (*Querquedula discors*), represented in Europe by the garganey (q.v.), is very abundant in many parts of North America. It is rather larger than the common teal. The head and neck are blackish with a large white crescent in front of the eye. The wing coverts are sky-blue, and the under parts are purplish gray with black spots. The cinnamon teal (*Querquedula cyanoptera*) is also blue-winged, but the general color is rich purplish chestnut and there is no white on the head. This is a South American duck, which is also common west of the Rocky Mountains as far north as Oregon. Two other species belong to South America. Consult authorities and Plate under DUCK.

TEALL, tē'al, JETHRO JUSTINIAN HARRIS (1849-). An English geologist, born at Northleach, Gloucestershire. He studied at St. John's College, Cambridge, of which he was a fellow in 1875–79. Teall served as director of the Royal Geological Survey and Museum of Practical Geology in 1901–13 and was a member of the Royal Commission on Coal Supplies in 1901–05. He was highly honored by scientific bodies, being president (1900–02) of the Geological Society of London, from which he received the Bigsby and Wollaston medals in 1905; president of Section C of the British Association (1893), vice president of the Royal Society of London (1900–01), and Delesse prizeman of the Academy of Sciences, Paris (1907). Besides papers on geology and petrology Teall wrote *British Petrography: with Special Reference to the Igneous Rocks* (1888).

TEANO, tā-ä'nō. A city in the Province of Caserta, Italy, 42 miles north-northwest of Naples, at the foot of the extinct volcano Rocca Monfina (Map: Italy, D 4). It was one of the leading cities of Campania. The present town is interesting for its old ruins, among them a castle. Pop. (town), 1911, 6067.

TEARS OF THE MUSES. A poem by Edmund Spenser, published in 1591.

TEASEL, tē'z'l (AS. *tæsel*, *tæsl*, OHG. *zeisala*, teasel, from AS. *tæsan*, Bavarian Ger. *zaisen*, to tease wool), *Dipsacus*. A genus of plants of the family Dipsacaceæ. The only valuable species is the fuller's or clothier's teasel (*Dipsacus fullonum*), a native of southern Europe, naturalized in the United States. It is a biennial, several feet high, with sessile serrated leaves, prickly stems and leaves, and with cylindrical heads of pale or white flowers, between which are oblong, hook-pointed, acuminated, rigid bracts. The plant is cultivated for the heads, which are cut off when in flower, and are used for raising the nap of cloth, a purpose for which no mechanical contrivance has been found to equal them. The split heads are fixed on the circumference of a cylinder, which is made to revolve against the surface of the cloth. The wild teasel (*Dipsacus sylvestris*), from which fuller's teasel is supposed to have origi-

TEASEL (*Dipsacus sylvestris*).

nated, has straight instead of hooked prickles on the heads. It is a common and troublesome weed in some parts of the United States.

TEA TREE. See CAJEPUT.

TEA-WATER PUMP. A spring famous in New York during the eighteenth and part of the nineteenth century. It was situated north of the present City Hall Park, on Chatham Street, and was for a long time the chief source of supply for drinking purposes, owing to the purity of its water.

TEAZLE, tē'z'l, LADY. A sprightly country-bred girl who is married to an exacting but kind-hearted old gentleman, Sir Peter Teazle, in Sheridan's *School for Scandal.*

TEBRIS. See TABRIZ.

TECHE (tĕsh) **BAYOU.** A bayou in Louisiana (Map: Louisiana, F 6). It leaves the Bayou Courtablau, in St. Landry County, and flows southeast in a course of about 100 miles, during which it sends off numerous branches to the Atchafalaya Bayou, and finally empties into that bayou below Grand Lake, sending also several widely separated arms directly to the Gulf of Mexico. It is interesting as having been anciently a main outlet of the Red River, and is lined with high and extensive alluvial banks which form excellent agricultural lands safe from inundations. The bayou is navigable for steamers to St. Martinsville, about 90 miles.

TECHNICAL EDUCATION (from *technic*, from Gk. *τεχνικός*, *technikos*, relating to art or handicraft, from *τέχνη*, *technē*, art, handicraft, from *τίκτειν*, *tiktein*, to bring forth, produce). The term technical education, strictly speaking, embraces all instruction that has for its object the direct preparation for a career or vocation. In common use, the designation is applied to such instruction as bears directly upon the industrial arts. The field of such education ranges from instruction in the arts and sciences that underlie industrial practice in its broadest and most complex relations to the simple training in manipulation needed for the prosecution of some productive trade. This wide province naturally calls for numerous and widely divergent types of schools.

Technical schools may conveniently be divided into three classes: (1) Institutions of a collegiate or university grade, to which the titles engineering schools, institutes of technology, polytechnic institutes, and schools of applied science are variously given, and which are devoted to instruction in advanced mathematics and science, and the theory and practice of industrial operations. (2) Schools in which the purpose is to prepare for practical work in some particular field of industry and which afford instruction in those branches of science and art that underlie its special problems. This class is represented by schools of weaving, dyeing, building, and machine construction and drafting. The term technical school has been used in a specialized sense in this article to denote institutions of this character. In this class may be grouped schools of industrial art in which the study of design is supplemented by training in manipulation. Evening continuation schools which afford instruction in science, art, and technical methods may also be considered in this group. (3) Trade schools which supply a training in the practice of some productive trade. The function of the first type of school is to educate its students for managers and superintendents of industrial establishments, consulting and designing engineers and architects, etc.—in other words, to supply leaders and organizers for the industrial world; that of the second, to provide foremen, designers, and experts in special lines of industrial practice; and that of the third, to train craftsmen for practical work at a trade.

Engineering Schools; Schools of Applied Science; Institutes of Technology. The earliest establishment of this type of school occurred in France and Germany. In France the Ecole des Ponts et Chaussées, originally started in 1747 as a drawing school, was organized in 1760 for the training of engineers for the government service. In 1794 the celebrated Ecole Polytechnique was founded, primarily to fit men for the engineer and artillery corps of the French army. Not only has this school done much to set the standard of scientific training for the state service, but, from the fact that many of its graduates have engaged in private work, it has exerted a strong influence upon general industrial practice. Other special engineering schools have been established at different times by the French government, and in 1829 the Ecole Centrale des Arts et Métiers was founded as a private institution. The standards of this school have always been of the highest character. In Germany the first institution that approached a modern engineering school was the School of Mines founded at Freiberg in 1824, in order to develop engineers for working the mines in the neighborhood. Later in the century came the great development of pure science in the German universities, and following this came an era of equal activity in the field of applied science, which quickly resulted in the widespread establishment of polytechnics or *Technische Hochschulen.* Rivalry between the various states played a part in the spread of these schools, each striving to outdo the others in magnificence of buildings and completeness of equipment. These institutions, which often had their beginnings in secondary technical or trade schools, have now become foundations coördinate with the universities, requiring equal academic preparation for admission, and representing specialized courses in engineering, architecture, industrial chemistry, and agriculture. Schools of this kind are uniformly supported by the governments of the various states, and present a very highly developed organization. The splendid Technische Hochschule at Charlottenburg, and similar institutions at Munich, Dresden, Darmstadt, Hanover, Cassel, Aachen, and Breslau are foremost examples of this class. Engineering schools of a high grade are maintained also by the governments of Austria, Italy, Switzerland, Sweden, and Russia. Great Britain awakened more slowly to the need of technical education than other European countries, the chief stimulus being interest aroused by the Exhibition of 1851. In 1881 a Royal Commission on Technical Instruction was appointed to investigate the entire subject. Among other results of this awakening was the foundation of the City and Guilds of London Institute, formed by a union of many of the wealthy corporations of the old London guilds. The scope of the Institute activities includes the support and management of three institutions and the support of several others in the city of London, and the direction of a system of examinations dealing with the work of technical classes throughout England and Wales, and represents a system that touches all the important phases of technical instruction with the single exception of the trade school. The most important of the three schools established in London, the Central Institution of the City and Guilds of London Institute, a well-organized school of technology, now forms a part of the Imperial College of Science and Technology, and is recognized as a school of the University of London in the faculty of engineering. The Institute gave £100,000 for buildings and equipment, and annually contributes £10,000 to its support. Courses are provided for training engineers, architects, industrial chemists, and technical teachers. Other schools of an advanced character and several university departments of applied science have come to the front in Great Britain, prominent among which are the University of Manchester, the Manchester School of Technology, the University of Birmingham, the University of Leeds, the University of Sheffield, Armstrong College, and a number of others. In 1913–14 the Board of Education paid grants to 24 different institutions for technological and professional work, all of university grade. Schools of engineering are maintained at the University of Glasgow, the University of Edinburgh, University College of Dundee, and the Glasgow and West of Scotland Technical College.

In the United States the development of the school of technology has been exceedingly rapid, and has resulted in a type of institution that in some respects is the superior of anything to be found abroad. The Rensselaer Polytechnic Institute (q.v.), founded in 1824 by Stephen Van Rensselaer as a school of theoretical and applied science, was the first establishment in this field. The work of this school has been almost exclusively devoted to the training of civil engineers. In response to the growing demand for scientific instruction, the Sheffield Scientific School (1847) at Yale and the Lawrence Scientific School (1848) at Harvard were founded. Most of the technical schools, however, date from the later years of the Civil War. In 1861, through the efforts of Prof. William B. Rogers, the charter of the Massachusetts Institute of Technology (q.v.) was granted, and in 1865 the first classes were organized. The Worcester Polytechnic Institute (q.v.) was opened to students in 1867. This was the first school of technology in the United States to provide systematic instruction in workshop practice as an element of the course in mechanical engineering. In 1864 the first courses in the School of Mines, Columbia University, were organized, and from this have developed the several schools of applied science of that institution. In 1871 the Stevens Institute of Technology (q.v.) at Hoboken was opened. The beginnings of the Sibley College of Mechanical Engineering and the Mechanic Arts were made at Cornell University in 1872, and other courses in applied science were soon established there. In the next 20 years a large number of schools of the first rank were founded either as separate institutions or as departments of universities. Notable among those of the first kind are Purdue University (q.v.), Lafayette, Ind.; Rose Polytechnic Institute (q.v.), Terre Haute, Ind.; the Michigan School of Mines, Houghton, Mich.; the Case School of Applied Science (q.v.), Cleveland, Ohio; and the Armour Institute of Technology (q.v.), at Chicago, Ill. Prominent among the second group are the engineering departments of Lehigh University, the Ohio State University, Washington University (St. Louis), and the universities of Michigan, Wisconsin, Minnesota, Pennsylvania, and California. The State land-grant colleges established under the Morrill Act of 1862 also gave a great impetus to the study of engineering and mechanic arts. See MORRILL, JUSTIN S.

The history of these schools has been marked by the development of a number of very significant features of instruction. To begin with, emphasis has from the first been placed upon the laboratory method of instruction, as opposed to sole reliance upon textbooks. Following the organization of instruction in pure science came that in applied science. Another feature that has characterized the instruction in many of these institutions is the degree of specialization in the instructing staff made possible by the large numbers of students. The courses of study of American schools of technology almost universally extend through four years.

Technical and Applied Art Schools; Continuation Schools. All the types of this group of institutions have reached a high point of organization on the continent of Europe. Technical schools, in which to practical training in the methods of a special craft is added instruction in the scientific principles upon which they are based, appear in greatest numbers in Austria, Germany, and France. Some have been established by guilds or masters' societies, some by a union of manufacturers of a town or city wishing to improve the efficiency of their establishments, and others by action of the local authorities or by the government. A steady tendency towards government control and support is apparent in all the continental countries. Prominent among schools of this type are the special schools for weaving and dyeing, of which frequent examples are found in various parts of Germany. The most famous institution of the kind is located at Krefeld, in Prussia. In this model institution very thorough study is made of the chemistry and technology of dyeing, and of the mechanism and pattern designing involved in weaving. The Advanced School of Weaving at Lyons, France, the School of Silk Weaving near Zurich, Switzerland, the School of Weaving and Dyeing at the University of Leeds, and the textile departments of the Manchester School of Technology and of the Bradford Technical College, are other examples of this type of school. In the United States similar schools are the textile and dyeing schools of the School of Industrial Art of the Pennsylvania Museum at Philadelphia and the textile schools at Lowell and New Bedford, Mass.

Another type of technical school found in Germany and Austria is the *Baugewerbeschule* or building trades school. These schools are generally open during the winter months alone. Only students are admitted who have had practical experience in some branch of the trade, and the courses deal with the principles and practice of building construction, the nature of materials, mechanical and freehand drawing, modeling, science, mathematics, and bookkeeping. The courses generally run through four terms and are strictly professional in character. Many of the *Fachschulen* of Austria, although aiming at trade instruction, might well be classed as technical schools on account of the character and extent of the technical instruction that is offered in addition to the practical work.

Another form of technical school is represented by a class of institutions of the secondary grade, which aim to prepare rather for entrance into industrial work than for direct mastery of any one special branch. In these schools the courses commonly include instruction in the elements of a general education, as well as the study of applied science and practical training in a number of representative industrial processes. The *Industrieschulen* and *Gewerbeschulen* of Germany and Austria are examples of this type. Courses in these schools are generally from three to five years in length, and embrace, besides practical industrial work, instruction in mechanical and freehand drawing, geography, business forms, mathematics, bookkeeping, science, and technology. Schools of this kind are found at Düslin, Chemnitz, Cologne, Düsseldorf, Leipzig, Munich, and Nuremberg. In Austria the School of the Technological Industrial Museum, at Vienna, is the foremost example, and serves as a model for all other schools of this class throughout the Empire.

France has a very important and highly organized system of state schools for the training of foremen and superintendents in mechanical industries at Chalons, Aix, Angers, Cluny, and Lille. The courses are three years in length. The instruction, both practical and theoretical, given in these schools, has been of so thorough a character that the result in large part has been to train managers and mechanical engineers rather than foremen. Other technical schools of an advanced character in France are the Industrial Institute of the North of France, at Lille, and the Institution Livet, at Nantes, which is a private foundation. A school of a special type exists at Lyons, the Ecole Martinière. Distinct courses are provided for boys and girls. In the former the sciences and arts are studied in their relation to commerce and industry. The object is not to prepare for any special trade, but to develop general capacity for an industrial or commercial career. The course, which lasts for three years, is very similar to those of the American manual-training schools. The courses for girls aim to furnish a trade training in commercial accounting, embroidery, industrial drawing, and women's tailoring, together with a general education. The Finsbury Technical College, in London, is the most important institution of this class in England. Several well-equipped schools of this general type exist in other parts of England, among which are the Manchester School of Technology, the Birmingham Technical School, and the Sheffield Technical School. In the United States the manual-training high schools (see MANUAL TRAINING) approach quite close to this last category of schools, but devote a larger proportion of time to general branches; more nearly similar are the recently developed technical and vocational high schools that have been established, for example, in Chicago, Cincinnati, and Fitchburg.

Schools of industrial or applied art have also reached their highest point of development on the continent of Europe. In Austria and Germany the *Kunstgewerbeschule*, often connected with an extensive and admirably filled museum, is found in all the large cities. Courses in drawing, painting, modeling, and design are provided, leading to some special branch of applied art. In some schools, notably those at Munich and Vienna, the handicraft side is prominent and much attention is given to practical work at carving, metal chasing, stained glass, leather embossing, fresco painting, embroidery, porcelain painting, lithography, smithing, and other lines. In France are to be found not only the first schools of painting, sculpture, and architecture in the world, but also the most thorough organized provision for instruction in decorative and industrial art. The government lends liberal support to the art schools, and assists in establishing new ones when the need of such is manifest. Some are supported entirely by the state, and others are assisted through grants. All are under the direction of the Minister of Public Instruction and Fine Art. Excellent schools of applied art are to be found in all parts of France, often with a distinct trend of instruction towards the industries prominent in the locality, as in the case of ceramics at Limoges and textiles at Roubaix. In Paris there are three schools which afford instruction in industrial art—the Ecole Nationale des Arts Décoratifs, the Ecole Germain-Pilon, and the Ecole Bernard-Palissy; the first to teach the principles of design in relation to industrial art as a whole, the last with direct reference to certain trades, with a liberal amount of workshop and laboratory practice. The great schools of the Government Science and Art Department (now under the Board of Education for England and Wales) at South Kensington represent the most important provision for instruction in industrial art in Great Britain. The work of these schools consists largely of drawing, painting, and modeling, and although the application of art to industry is counted as the main purpose of the institution, no practical work is attempted. A large number of smaller schools patterned upon the same model exist in other parts of Great Britain under the guidance and financial assistance of the Board of Education.

In the United States schools of applied art are not numerous, and in few cases is a training in the practical application of design attempted. Prominent among the institutions affording instruction in this field are the Cooper Union (q.v.), of New York City; the School of Industrial Art of the Pennsylvania Museum; Pratt Institute (q.v.), Brooklyn, N. Y.; Drexel Institute (q.v.), Philadelphia; the Maryland Institute, Baltimore; the Art Academy, Cincinnati; the Chicago Art Institute; the Rhode Island School of Design, Providence; and the Lowell School of Design, Boston.

Evening classes in science, drawing, design, and technical studies may well be considered in this second general group of schools. The *Fortbildungsschulen* of Germany and Austria are both day schools and evening schools. By the *Reichsgewerbeordung* (Imperial Industrial Law) of 1891 and 1900 local communities may make attendance upon such schools compulsory for both boys and girls between 14 and 17 years old, and such attendance is often a condition of employment. This law merely incorporated in the statutes conditions that had sprung up after the Franco-Prussian War. Freehand and mechanical drawing, and special instruction relating to the trades of the locality, are the principal subjects taught in such schools. In Vienna every prominent trade is represented by a special Fortbildungsschule, and Berlin supports a great number and variety of similar schools. The most notable development in this field has taken place in Munich under Dr. G. Kerschensteiner. Attendance at a continuation school is here compulsory for boys up to 18, and for girls for three years. Twelve general courses for unskilled laborers and errand boys and more than 50 trade schools for apprentices have been established. Close relations have been established between the schools, local trades, and industries, and special attention has been given to developing suitable methods of instruction, courses of study, and to securing the right type of teachers. The best state-wide system of continuation schools is that of Württemberg. Evening industrial schools played an important part in the thickly populated manufacturing centres of Belgium, where, in such towns as Liége, Brussels, and Seraing, thousands of workmen nightly received scientific and technical instruction bearing on their trades. There are many technical schools in Paris and other cities and towns of France that provide evening instruction. In most cases such evening classes are supported by commercial or industrial societies and bear upon the local industries.

Nowhere else is the organization of evening industrial classes carried to so high a point as in Great Britain. Through the system of examinations and grants directed formerly by the Science and Art Department, now part of the Board of Education, classes in drawing, modeling, design, mathematics, and many branches of science and technical subjects are maintained throughout the United Kingdom. From 1879 to 1890 the City and Guilds of London Institute performed a similar function for technical and industrial classes. By their liberal financial assistance through examination grants, not only were all manner of technical courses organized throughout the country, but practical trade classes were opened to broaden and further the experience of those engaged in the trades. The Act of 1889 which authorized local authorities to build and maintain technical schools, and to contribute to evening technical classes out of the local rates, followed by the Law of 1890 which set aside a portion of the excise duties for the support of such schools, rendered the financial assistance of the Institute no longer essential, and since 1890 that association has confined its grants to classes in the city of London. The Institute continues its functions as an examining body, and is recognized as setting the standard for all work in this field. Since the beginning of the century the tendency has been in the direction of organizing evening work in courses of a progressive nature spread over four or five years, in order to secure some correlation and unity and to prevent a scattering of interest and energy.

In the United States such evening schools rapidly assumed an important place. The free evening classes of the Cooper Union have provided an opportunity for thousands of young men to advance themselves. The evening classes of the Pratt Institute, Brooklyn, N. Y., represent an important and highly developed example of such instruction. Worthy of mention are also the Drexel Institute, Philadelphia; the General Society of Mechanics and Tradesmen, New York City; the drawing school of the Franklin Institute, Philadelphia; the Lewis Institute, Chicago; and the evening classes conducted by Young Men's Christian Associations all over the country.

Trade Schools. These institutions have come into existence almost entirely since the middle of the nineteenth century. The industrial conditions produced by an era of quantity of production and division of labor have developed the real problem of the trade school. In the days of the old guilds, when both production and exchange were in the hands of the master workman, the natural provision for trade training was found in the apprenticeship system. As soon, however, as the master workman ceased to be both merchant and craftsman, the apprentice began to lose his natural position in the industrial order. In most trades the master workman has developed on one side into the director of an industrial establishment, or has become the foreman of a large number of workmen. From this situation, and from the fact that the specialization of labor in most trades dependent upon machinery renders any comprehensive training in such trades under ordinary conditions impracticable, and also because of the restrictive regulations of trades-union as to apprentices, arises the modern demand for the trade school. Manual dexterity and knowledge of processes are naturally the primary object in such schools. Examples of this kind of school, in spite of a general notion to the contrary, are not numerous even on the continent of Europe.

In Germany and Austria it is considered unwise to introduce purely technical instruction into the period of the common school, so that all schools for technical training admit only pupils more than 14 years of age. Besides the *Gewerbeschulen*, of a secondary grade, are the *Fachschulen*, or schools which deal with the training for some one special trade. These schools are distributed in industrial centres throughout the two empires according to local needs. In some of these schools the courses range from two to four years, and include instruction in drawing, elementary mathematics, science, and the technology of the particular trade. From the nature and range of instruction, many of these would be more properly classified as technical schools, and even in the cases where the object is simply to combine the elements of a general education with the training of a craftsman, the length of time required prevents any large attendance of the artisan class. The actual effect is consequently to train a few foremen and superior workmen, rather than to feed the ranks of the large army of workers. In some of the large cities, notably in Berlin and Munich, numerous evening trade classes are maintained, which afford the learner already apprenticed at a trade most practical opportunities to increase his skill, as well as to broaden his knowledge. In Belgium several distinctive trade schools exist, among which those at Tournay and Ghent are prominent. To these schools are admitted boys from 13 to 16 years old, who spend three years in the practice of a particular trade, together with study of general branches and drawing. Trade schools for girls have also received much attention in Belgium. In certain special trade schools in Belgium the experiment of paying the pupils for coming to the schools, in order to compensate for the loss of wages, has been made.

But it is in France that the question of training for the trades has received the greatest official attention and that the organization of schools for such training has reached the highest point. By the Law of 1880 provision was made for the establishment of *écoles manuelles d'apprentissage* as a distinct class of the *écoles pri-*

maires supérieures. These schools were intended either to prepare for or to shorten the period of apprenticeship, and were placed under the joint control of the Ministry of Public Instruction and the Ministry of Commerce and Industry. In them workshop training plays a prominent part, but a liberal amount of general instruction is also given during the three years' course. Pupils are admitted when 12 or 13 years old. By an administrative blunder, the feature of the Law of 1880 creating such schools remained inoperative until 1888, except in Paris, where the municipality early equipped and developed three successful trade schools, one for wood and metal working, one for furniture making, and one for the book industries. After 1888 apprenticeship schools began to appear in the provinces, but inasmuch as no common programme has been defined, the amount of practical instruction varied considerably, and in many cases was far too small to serve as a substitute for apprenticeship. In 1892 the failure of these provincial schools to fulfill their intended function led to a new law, which provided that all the *écoles primaires professionelles*, in which practical work formed an important part, should be made into a new class of schools called *écoles pratiques de commerce ou d'industrie*, to be placed under the sole control of the Ministry of Commerce and Industry. The organization of such schools, in which the amount of practical instruction is increased to 30 or 33 hours a week, represents a deliberate attempt to establish a comprehensive system of primary trade schools under state control. In Switzerland the state and municipalities support numerous trade schools, mainly for watchmaking, in which the training, both practical and theoretical, is of a very thorough character. Another feature connected with trade training in Switzerland, and one that has to some extent been copied in Germany, is a system of apprentice examinations supervised and supported by the state. These examinations in many cantons are made obligatory upon every apprentice, and consist of an examination held at the end of the term of apprenticeship upon the practice and theory of his trade. The trade school can hardly be said to have gained a foothold in Great Britain, where the sentiment almost universally prevails that the shop is the only proper place for learning a trade.

In the United States a distinctive type of trade school was developed in the foundation of the New York trade schools in 1881. Both day and evening classes are conducted in this institution. The evening classes, although admitting beginners, are largely made up of young men already started at their trades. In the day classes young men are admitted only at an age —from 17 to 25—when they will be able to learn rapidly, and so acquire sufficient skill in short courses of four months to enter at once upon practical work. The purpose is to give a thorough grounding in the practice and theory of a trade which may be perfected by later experience in regular work. The school instruction is confined entirely to practical work. Evening schools similar to those of the New York trade schools have been established by the Pratt Institute, Brooklyn, the Philadelphia Master Builders' Exchange, and the Massachusetts Charitable Mechanics' Association of Boston. To these should be added the first instance of public support of such an institution in the Evening School of Trades at Springfield, Mass.

Another type of trade school has made its appearance in the United States in the Williamson Free Schools of Mechanical Trades (q.v.) near Philadelphia, in the Baron de Hirsch Trade School of New York. A number of public trade schools have also been established since 1907, e.g., Milwaukee School of Trades, and others at Philadelphia, Portland, Oreg., Worcester, Mass., and Indianapolis. Institutions similar in plan to some of the European trade schools, in which the aim is to combine the teaching of a trade with a general education, are represented by the California School of Mechanical Arts and the Wilmerding School of Industrial Arts of San Francisco. Of a lower grade are the preparatory schools that have developed since 1908, when the first school of type was founded at Rochester, N. Y., to give some knowledge of industries and shop methods to boys between the ages of 14 and 16. A number of similar schools have been established in Massachusetts.

In addition to the regular institutions, noted above, several instances exist in Europe and the United States of factory or employees' schools. These schools are almost uniformly conducted in the evening, although the practice is not uncommon of allowing time off to younger employees to attend school during working hours, and in the main provide instruction of a nature related to the practical work of the employees, such as drawing and mathematics. Examples of such schools in the United States are those conducted by R. Hoe & Co., printing-press manufacturers, of New York City, and the Cleveland Twist Drill Co. The Ludlow Manufacturing Co., of Ludlow, Mass., which employs large numbers of women and girls, supports an evening school giving instruction in cooking, sewing, and physical culture. Somewhat similar classes are carried on by the National Cash Register Co., of Dayton, Ohio. Employees' schools in which specialized technical instruction is given are conducted by several associations of employees and also by individual manufacturing concerns in various parts of France. Quite different from such schools are the schools for the children of employees, which are maintained by a number of large industrial corporations in Great Britain, France, and Germany. Notable among these are the schools of Lever Brothers, Port Sunlight, England; of the Krupp Works, Essen, Germany; and the Trade School of the Northern Railway Co., Paris.

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of the Royal Commission on Technical Education for Great Britain (London, annually); *Proceedings of the International Congresses for Technical, Commercial, and Industrial Education; Annuaire de la jeunesse* (Paris).

TECK, Alexander, Prince of (1874–). A British soldier. He was born at Kensington Palace, London, the third son of the Duke of Teck and Princess Mary Adelaide, and a brother of Queen Mary, consort of George V. Educated at Eton and at the Royal Military College, Sandhurst, he became successively a captain in the Seventh Hussars and in the Royal Horse Guards, and later was brevetted lieutenant colonel in the Second Life Guards. He served in Matabeleland in 1896, in the South African War in 1899–1900, and in the European War in 1914–15, being mentioned in the dispatches in each. For services in the South African War he also gained the Queen's medal with five clasps and was made a member of the Distinguished Service Order. In 1914, before the outbreak of the war, he was appointed Governor-General of Canada; but it was later decided to retain the Duke of Connaught in this office until the end of the war. Prince Alexander married in 1904 Princess Alice, daughter of the Duke of Albany and granddaughter of Queen Victoria.

TECUCIU, tȧ-kōō′chê. A town of Rumania, in Moldavia, 40 miles northwest of Galatz, on the right bank of the Berlad River (Map: Balkan Peninsula, F 2). It has an active trade. Pop., 1900, 13,405.

TECUMA (tā′kōō-mä′) **PALM.** See Astrocaryum.

TECUM′SEH. A city and the county seat of Johnson Co., Neb., 48 miles by rail southeast by south of Lincoln, on the Nemaha River, and on the Chicago, Burlington, and Quincy Railroad (Map: Nebraska, H 4). It is the trade centre of a stock and farming region. Tecumseh has a Carnegie library. Pop., 1900, 2005; 1910, 1748.

TECUMSEH (Flying Panther, Meteor), Tecumthe, or Tecumtha (c.1775–1813). A famous Indian chief, born near the site of the present town of Springfield, Ohio. When about 35 years of age he formed a plan for a great confederacy of the Indians against the whites, which should have jurisdiction, among other things, over the alienation of Indian lands. In this work he was assisted by his brother Elkswatawa or Tenskwatawa (q.v.), commonly known as The Prophet, and by British agents. In the summer of 1808 Tecumseh and his brother established a village near the mouth of Tippecanoe Creek in Indiana, and here Tecumseh put into practice some of his ideas for returning to the virtuous primitive condition of the Indians by prohibiting the use of whisky and other demoralizing practices introduced by the whites. Three years later he went on a visit to the southern Indians, especially the Choctaws, Creeks, Cherokees, and Seminoles, and by his wonderful eloquence is considered to have kindled among them the flame that in 1813 burst into the Creek War. In his absence, however, his followers were defeated on Nov. 7, 1811, by a force under Gen. William Henry Harrison. (See Tippecanoe, Battle of.) In the following year he joined the British at Malden, and early in August routed a force of Ohio militia, but was defeated and wounded in the skirmish of Maguaga. Despite his defeat, however, he was commissioned a brigadier general in the British army, and with several hundred Indians assisted in the capture of Detroit. In January, 1813, he played an important part in the siege of Fort Meigs (q.v.), and prevented the massacre of prisoners taken in the sortie from the fort. He was killed at the battle of the Thames (q.v.), while bravely resisting the attack of the mounted Americans under Col. Richard M. Johnson. Tecumseh was a man of many high qualities, with impressive manners and wonderful natural eloquence. Consult: Drake, *Life of Tecumseh and his Brother, the Prophet, with an Historical Sketch of the Shawnee Indians* (Cincinnati, 1841); W. J. Armstrong, in *Heroes of Defeat* (ib., 1905); Eggleston and Seelye, *Tecumseh and the Shawnee Prophet* (New York).

TEDAS, tā′dȧz. The northern division of the Tibbus (q.v.), living in Tibesti and the adjoining oases of the eastern Sahara, and connected with the outside world by the main camel route between the city of Tripoli and Lake Chad. In this portion of the great desert are inexhaustible supplies of rock salt, and the Tedas employ thousands of camels in conveying this material throughout Central Africa.

TED′DINGTON. A residential town in Middlesex, England, on the Thames, 13 miles west of London (Map: London and Vicinity, F 4). The municipality maintains reading rooms and recreation grounds, and provides garden allotments. The National Physical Laboratory was inaugurated here in 1902. Pop., 1901, 14,029; 1911, 17,847.

TE DE′UM. A well-known hymn, so called from its opening words (*Te Deum laudamus, Te Dominum confitemur*, We praise Thee, O God, we acknowledge Thee to be the Lord), commonly sung on all occasions of triumph and thanksgiving, and a theme upon which the most celebrated composers have exercised their musical genius. The hymn is one of the most simple, and at the same time the most solemn and majestic and most admired in the whole range of hymnology. Its authorship is uncertain. Picturesquely and uncritically it has been described as the joint production of Saints Ambrose and Augustine, into which they both burst forth by a common inspiration on occasion of the baptism of Augustine. From this supposed origin the *Te Deum* is commonly called the Ambrosian hymn. It has been ascribed to Hilary of Poitiers, and, in recent years, to Nicetas of Remesiana (c.400). Besides its general use on occasions of joyous celebrations, the *Te Deum* forms part of the daily matins of the Roman breviary, and is recited at the end of matins on all festivals, and on all Sundays except those of Advent and Lent. With a similar exception, it forms part of the morning prayer of the Anglican Prayer Book, being sung after the first lesson. Its use dates from the sixth century. Consult John Wordsworth, *The Te Deum: Its Structure* (2d ed., London, 1903), and Julian, *Dictionary of Hymnology*, new edition (ib., 1907).

TEES, tēz. A river of north England. It rises on Cross Fell, Cumberland, and flows east between the counties of Durham and York. It enters the North Sea 10 miles below Stockton, to which town it is navigable for small vessels. Length, 80 miles (Map: England, E 2).

TEE TEE. See Titi Monkey.

TEETH (AS. *tāþ*, Ger. *Zahn*, tooth; connected with Bret., Welsh *dant*, Lat. *dens*, Skt. *danta*, tooth). Calcareous organs embedded in the skin within or near the mouth in most vertebrates, acting primarily for the prehension and trituration of food. Some teeth, such as the tusks of the wild boar or of the elephant, have secondarily acquired another function, viz., that of offensive and defensive organs, especially with reference to combats between rival males.

Teeth are dermal structures, homologous with the placoid scales or denticles which cover the entire body of fishes (q.v.). At the anterior end, say of the body of a dogfish, the skin turns in to form the lining or mucous membrane of the mouth and with it the scales are carried. In fishes these dermal denticles appear in the skin very early both in their ontogenetic and phylogenetic history, but do not occur in *Amphioxus* or in cyclostomes. They first appear in selachians in the form of small denticles or spines arranged in longitudinal and transverse rows, each attached to a basal plate, and directed caudad. Both ectoderm and mesoderm take part in the formation of these dermal denticles, as in the case of the teeth of the higher vertebrates. The name "tooth germ" is given to the tissue that is destined to develop into the teeth. The mesoderm forms a papilla which secretes dentine in its outermost layer. Within the dentine there is a cavity filled with mesodermal tissue and blood vessels. From this cavity fine tubules pass into the dentine. Outside the dentine is a layer of enamel secreted by ectodermal cells. The first impulse towards tooth formation seems to reside in the derma. As the dermal papilla grows it comes to be covered by a layer of large columnar cells from the epidermis. The enamel is secreted from the lower surface of these epidermal cells. As the dermal cells multiply they give rise to an elongated papilla which projects backward. The deep-lying connective-tissue layers of the derma at the same time secrete salts of lime and thus a sort of connective-tissue bone (the so-called tooth cement) is produced, and by means of it the spine gains a firm support. The basal plates of tooth cement form a shield of considerable protective value, and in some fishes, such as the bony ganoids, a hard protective skeleton is thus produced. In the higher vertebrates this bony covering is lost over most of the body, but persists in the head region, and becomes some of the most important bones of the skull.

In fishes the teeth are usually abundant, and are either spiny or blunt, and may be set close together like a cobblestone pavement (see CESTRACIONT) to fit them for grinding up shells. In the swordfish they form the teeth of the sword. Amphibians possess few teeth. They are conical, end in a single or double apex, and are usually present on the premaxilla, maxilla, mandible, vomer, and palatine bones, and occasionally on the parasphenoid. They occur in additional locations in the larvæ of some forms. Teeth are present in all groups of reptiles except the *Chelonia*, and even there exist for a time in the embryonic stage of *Trionyx*, showing that the toothless state has been secondarily acquired by the turtles. The reptilian teeth are usually larger and stronger, and are limited to more special regions, than among lower vertebrates. The teeth of reptiles, as well as those of fishes, are in general homodont, or alike throughout the series. In reptiles the teeth are connected with their support in two ways: either the teeth are firmly fused to the bone or else they lie in cup-shaped sockets of the bone, the alveoli. This condition exists in the so-called thecodont reptiles. The teeth, which are fused to the bone, may either lie in a furrow at the inner side of the jawbone (pleurodont type) or else they arise from its free upper edge (in the case of the lower jaw), and are acrodont. In many kinds of snakes certain of the maxillary teeth of the upper jaw are differentiated into organs of offense and defense. These are the fangs or poison-carrying teeth. (See SNAKE.) Birds have no teeth. Fossil birds (see BIRD, FOSSIL), however, possessed teeth, which were either embedded in grooves (*Hesperornis*) or in definite alveoli (*Ichthyornis*).

The dentition of mammals is highly variable, and the differentiation of the teeth in the various forms is to be explained by adaptation to the character of the food. All the teeth are embedded in alveoli of the jawbones, to which the growth of teeth is confined. The teeth are so arranged that those of the upper and lower jaws alternate. The teeth of one jaw oppose the interspaces between the teeth of the other jaw. Thus each tooth presses against a portion of two teeth of the opposite set. When all opposing pressure fails the tooth thus rendered functionless tends to be extruded. This alternating arrangement prevents the loss of one tooth from greatly affecting the teeth of the opposite set. Most mammals are diphyodont—i.e., possess two sets of dentition—viz., the deciduous or milk dentition and the permanent teeth. In most of the fishes as well as in many of the *Amphibia* and reptiles the teeth can be renewed indefinitely. A few mammals, viz., the *Cetacea* and *Edentata*, are monophyodont, i.e., possess only one set of teeth. The milk teeth are supplanted by a process of absorption which goes on in certain cases to such an extent that the root is practically removed. This removal is effected by giant cells analogous to, if not identical with, the osteoclasts that tear down bone. The teeth usually cease to grow after being fully formed, but in edentates and rodents growth continues throughout life, and is necessary in order to supply the wear on the teeth brought about by the gnawing habits of these animals.

Mammalian teeth are classified according to their shape and function into incisors, canines, premolars, and molars. The four front teeth in the case of man are blunt, flattened, and chisel-shaped, and are fitted for cutting or dividing the food. They are the incisors. In recently cut incisors the cutting edge is raised in three scallops, which soon wear away. The edge of the incisor is formed by a beveling off of the dentine on the inner or lingual surface. The two central upper incisors in man are slightly larger than the two laterals. This difference is more marked in anthropoid apes. The lower central incisors are narrower than those of the upper jaw. The lower lateral incisors are larger than the lower central pair. The two canines or eyeteeth on each jaw are stronger both in root and crown than the incisors. The crown is blunt and pointed. The canines are succeeded by two premolars or bicuspids on each side of the jaw, which correspond to the three and four premolars of the typical mammalian dentition. Their crowns possess two cusps. The root is normally single, but is often grooved or cleft by a longitudinal furrow into two or even three roots. The premolars of the lower jaw are smaller than those of the upper. The molars are three in number on each side of the jaw. The form of the first molar is the most constant. The roots are three in number. The third molar, or wisdom tooth, is the most variable as to its time of appearance; it may be cut almost as soon as the other molars, or many years later, or not at all.

In existing mammals there is a certain degree of gradation between the forms of the teeth. The typical number of mammalian teeth is 44. The human number is 32 in the permanent set and 20 in the milk set. In the human set the third incisor and the first two premolars of the typical mammalian set are absent, hence at the canines in man there is an abrupt change both in front and behind. For convenience and brevity the number and kinds of teeth of mammals are usually designated by means of a formula as follows:

For marsupials:

$$i\,\tfrac{3}{3}\;c\,\tfrac{1}{1}\;pm\,\tfrac{3}{3}\;m\,\tfrac{4}{4} = 44.$$

For eutherian mammals:

$$i\,\tfrac{3}{3}\;c\,\tfrac{1}{1}\;pm\,\tfrac{4}{4}\;m\,\tfrac{3}{3} = 44.$$

For man:

$$i\,\tfrac{2}{2}\;c\,\tfrac{1}{1}\;pm\,\tfrac{2}{2}\;m\,\tfrac{3}{3} = 32.$$

See cut in CHILD, DEVELOPMENT OF.

It is often very difficult to determine which teeth are to be accounted incisors, canines, etc., and the following rule is sometimes employed:

Incisors, upper jaw, on premaxilla.

Incisors, lower jaw, correspond to upper.

Canines of upper jaw, next tooth immediately behind suture of maxilla and premaxilla.

Canines of lower jaw, close in front of upper canine.

Premolars replace milk molars.

Molars, behind milk molars (when present).

A tooth is usually described as consisting of three parts—the crown, neck, and root—and is composed of three hard secretions—the dentine, enamel, and cement—and a central pulp cavity. The human tooth fits into the jawbone much like a peg into its socket. This manner of union is termed gomphosis. The tooth does not, however, occupy the entire socket, for there is besides a lining of periosteum, which at the root turns upward around the tooth as far as the neck, where it becomes continuous with the gums. This packing around the tooth is somewhat elastic and allows of slight motion. The elasticity of the packing doubtless diminishes the shock which would be caused in mastication were the teeth rigidly attached in their bony sockets. When the periosteum is inflamed the swelling pushes the tooth outward in the socket and loosens it. The dentine forms the great mass of the tooth, surrounds the pulp cavity, and is covered, in the human tooth, by a layer of enamel, the hardest of animal tissues; in other mammals this layer of enamel may cover all or only a part of the exposed portion of the tooth or may be absent. The condition that more commonly prevails is that the enamel envelops the entire crown of the tooth and stops rather abruptly at about the level of the gum.

In its finer structure dentine is in some cases difficult to distinguish from true bone. Typical dentine, such as exists in human teeth, differs from bone both in structure and in chemical composition, and is known as hard or unvascular dentine. It is hard, elastic substance with a yellowish-white hue, which is made up of a number of minute, wavy, branching tubules, parallel to one another and opening internally into the pulp cavity. These tubuli contain finely cylindrical prolongations (dentinal fibres) from cells in the pulp cavity, intimately connected with the nerves of the pulp. The different kinds of dentine have been classified as (1) hard or unvascular dentine; (2) plicidentine; (3) vasodentine; (4) osteodentine. The unvascular dentine has been described above. In the second class the pulp cavity is irregular in outline, with many tubes and canals traversing the dentine in various directions, some carrying blood vessels. Such a condition obtains in many of the lower vertebrates and in some mammals. The osteodentine closely approaches bone in structure. In it pulp and calcified tissue are mixed up, for there is no distinct pulp cavity. Such dentine is found in the teeth of many sharks.

The cement forms a coating over the roots of the teeth and when unusually thick may even unite the roots of contiguous teeth. In the human teeth it extends upward to cover the edge of the enamel. It covers, at first, the entire teeth of certain vertebrates, such as the elephant, and covers the crowns of the teeth of ruminants. It is derived from the tooth follicle and is closely allied to bone.

The cavity of the tooth is filled with the tooth pulp, which is composed of a gelatinous matrix and contains cells, nerves, and blood vessels. The outermost cells, known as odontoblasts, form a layer next the bone. These cells are connected by processes with one another and with deeper-lying cells, and on the periphery the processes extend into the dental tubuli.

The gums are continuous with the mucous membrane of the mouth, but are much thickened. Within the gums are tendinous fasciculi, and others extend up into them from the periosteum. These give the gums hardness. They are richly supplied with blood vessels, but have few nerves. The gums are continuous with the periosteum of the alveoli, a connective tissue richly supplied with blood vessels and nerves.

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TEETHING. See CHILD, DEVELOPMENT AND GROWTH OF; TEETH.

TEFFIN, CHARLES. See ARMAND.

TEFFT, BENJAMIN FRANKLIN (1813–85). An American Methodist Episcopal clergyman. He was born near Utica, N. Y., and graduated at Wesleyan University in 1835. He served as professor of Greek and Hebrew languages and literature in Indiana Asbury (now De Pauw) University from 1843 to 1846; as editor of the *Ladies' Repository*, Cincinnati, Ohio (1846–50); and as president of Genesee College, Lima, N. Y. (1851–54). In 1862 he became United States Consul at Stockholm and acting Minister to Sweden and later was commissioner of immigration from the north of Europe for the State of Maine. From 1873 to 1878 he edited, at Bangor, Me., the *Northern Border*. He wrote: *The Shoulder Knot* (1850); *Hungary and Kossuth* (1851); *Webster and his Masterpieces* (1854); *Methodism Successful* (1860); *The Present Crisis* (1861); *Evolution and Christianity* (1885).

TE′GEA (Lat., from Gk. Τεγέα). An ancient city of southeastern Arcadia (q.v.). Its territory included the southern part of the great eastern plain of Arcadia, of which the northern part was occupied by Mantineia (q.v.). It appears to have included the modern villages of Hagios Sostis, Palæo-Episkopi, Piali, and Ibrahim Effendi, south of Tripolitza, though but few remains are visible, partly because of a deep deposit of alluvium, and partly from the destruction due to the later inhabitants. The most important ruins are those of the great temple of Athena Alea, built by Scopas (q.v.), excavated first in 1879, and later, in 1902 et seq., by the French School at Athens. The dimensions of the temple (about 163 × 70 feet) and important fragments of its sculptures were determined by Milchhöfer in 1879. The city was celebrated in the heroic legends, and for a long time seems to have opposed Sparta on equal terms, but during the sixth century B.C. was forced to join the Spartan League. At Thermopylæ there were 500 Tegeans, and at Platæa 3000, of whom one-half were hoplites. Later they were again involved in war with Sparta, and after two defeats remained true allies until the invasion of Epaminondas (370 B.C.), when a democratic government replaced the aristocracy, and the city joined in the foundation of Megalopolis (q.v.). Later we find Tegea in the Ætolian League, in alliance with Sparta, forced into the Achæan League, at war with Sparta, and sharing in the confused politics which mark the history of the lesser Peloponnesian cities during the third and second centuries. A good account of the place was given by Pausanias (q.v.) in the second century of our era. It seems to have been one of the most flourishing towns of Arcadia till it was sacked by Alaric (q.v.). Consult, besides the larger works on the Peloponnesus (q.v.) by Dodwell, Leake, Curtius, and others, Schwedler, *De Rebus Tegeaticis* (Leipzig, 1889); *Ἱστορία τῆς Τεγέας*, a publication of the Tegeatic Syndesmos (Athens, 1896); and the article "Tegea" in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914). For the fragments of sculpture found at Tegea, see E. A. Gardner, *A Handbook of Greek Sculpture* (2d ed., London, 1915). See Telephus.

TEGERNSEE, tā′gĕrn-zā′. A village in Upper Bavaria, charmingly situated on the lake of the same name, with an imposing castle, formerly a Benedictine abbey, founded in 719 and suppressed in 1804. The beautiful walks in the environs attract numerous visitors in the summer. A favorite point is the Grosse Parapluie, 2680 feet high and affording an admirable view of the lake and the encircling mountains. The ophthalmic clinic established by the late Duke Karl Theodor of Bavaria is still much frequented.

TEGETMEIER, tĕg′ĕt-mī′ĕr, William B. (1816–1912). An English naturalist and author, born at Colnbrook, Buckinghamshire. He was educated at University College, London, and for a time studied medicine, but turned his attention to natural history, and became a coworker with Darwin in experiments and observations on the question of variation (q.v.) and other scientific problems. To these he contributed mainly by study of domestic animals and especially of pigeons, and was instrumental in advancing the breeding and improvement of carrier pigeons and of fine poultry. He also coöperated with Eleanor A. Ormerod (q.v.) in lessening the destructive influence of the English sparrow. In 1857 he became a leading editor and essayist of *The Field* (of London), with which he was connected for 50 years. He wrote: *The Poultry Book* (1870); *The Homing Pigeon* (1872); *Natural History of the Cranes* (1881); *Pallas's Sand Grouse* (1888); *Table and Market Poultry* (1895); *Horses, Zebras, and Mule Breeding* (1895), with C. L. Sutherland; *The House Sparrow* (1899); *Pheasants* (5th ed., 1910).

TEGETTHOFF, tā′*get*-hôf, Wilhelm, Baron (1827–71). An Austrian admiral, born at Marburg, in Styria. He entered the Austrian navy, distinguished himself in the naval encounter with the Danes off Helgoland in 1864, became rear admiral, and in the war of 1866 commanded the Austrian fleet in the Adriatic. On the 20th of July he attacked and defeated the Italian fleet under Admiral Persano off the island of Lissa, although the Italian fleet was superior in number of ironclads to the Austrian. For this victory Tegetthoff was promoted vice admiral. In 1867 he was sent to Mexico to obtain from the government the body of the Emperor Maximilian, and in 1868 he was made commander in chief of the navy.

TEGNÉR, tĕng-nār′, Esaias (1782–1846). A Swedish poet and bishop, born at Kyrkerud, in Vermland. Tegnér graduated from the University of Lund (1802) and in 1805 became sub-librarian of the university and lecturer on æsthetics. In 1811 his poem on Sweden (*Svea*) won him universal admiration and an academic prize. Already his war songs and national odes had attracted the attention of the King and government. In 1812 he was made professor of Greek at Lund, and for the next decade gave himself almost wholly to clerical duties and theological studies. During these years he wrote the remarkable religious idyls, *The Pastor's Consecration* and *The Children of the Lord's Supper* (*Nattvardsbarnen*, 1820), as well as the fine romantic poem *Axel* (1822). His fame rests on the *Frithjof's Saga*, finished in 1825, the most popular poem in Swedish, though it lacks originality and unity, adhering closely to the legend on which it is founded and being less an epic than a series of ballads and odes. Even while unfinished it had sufficed to secure for Tegnér the nomination of the clergy to the bishopric of Vexiö (1824). In 1840 the insanity that afflicted his family unmistakably asserted itself. After a period in an asylum he returned for a while to active work, but soon became paralytic and so lingered till death. Thus it appears that Tegnér's significant production is confined to the years 1811–25. *Frithjof* has been rendered into almost all European languages and 19 times into English, best by Longfellow, who also translated *Nattvardsbarnen*. It was effective in banishing classical French taste from Sweden and in introducing the literary ideals of the Romantic school, though Tegnér always kept the clearness and artistic finish that go with calm objectivity. His verse is melodious, graceful, dignified, yet fresh, vigorous, and not without national or religious enthusiasm. See Swedish Language and Literature.

Tegnér's *Works* were collected in seven volumes (Stockholm, 1847–51). Three volumes of supplementary writings were printed (ib., 1873–

74), and a jubilee edition was issued in seven volumes (ib., 1882–85). The more important poems are in English, French, and German translations. A *Life* by Böttiger is prefixed to the first collected edition of the *Works.* Consult also: H. L. A. Kippenberg, *Esias Tegnér* (Leipzig, 1884); H. H. Boyesen, *Essays on Scandinavian Literature* (New York, 1895); Georg Brandes, *Eminent Authors of the Nineteenth Century,* English translation by R. B. Anderson (ib., 1896); Erdmann, *Esaias Tegnér* (Stockholm, 1896).

TEGUAN, tĕ-gwän′, or **TAGUAN.** One of the local names of a flying phalanger of New South Wales (*Petaurista volans*), which is black and about the size of the large Indian flying squirrels. It resembles the other flying phalangers (q.v.) in the possession of an effective parachute, and in its habits.

TEGUCIGALPA, tä′gōō-sē-gäl′pȧ. The capital of Honduras, Central America, on the left bank of the upper course of the Choluteca, 78 miles from its seaport, Amapala, on the Gulf of Fonseca (Map: Central America, D 3). It has a healthful location on a table-land 3250 feet above sea level, in a thickly populated portion of the republic. The region is agricultural, and has mines of gold and silver and marble, though the latter have lost their former importance. Its cathedral is the most important structure of the republic. There are a national university and a ladies' seminary. Tegucigalpa was an Aztec city and a place of some importance during the eighteenth century. It became the capital of Honduras in 1880. Pop. (est.), 22,923.

TEHAPHNEHES. See TAHPANHES.

TEHERAN, or **TEHRAN,** tĕ-h'-rän′. The capital of Persia and of the Province of Teheran, 70 miles south of the Caspian Sea, on a sandy and stony plateau 90 by 40 miles in extent (Map: Persia, D 5). Its elevation is 3800 feet. In 1869 the Shah caused the mud walls of the city to be torn down and five years later it was surrounded by a ditch and 58 unequal bastions, after the first system of Vauban. It is now in the form of an irregular octagon; the perimeter measures a little over 12 miles, incloses an area of 7½ square miles, and has 12 gates. Several broad, handsome boulevards have been laid out, and are lighted by gas, and a beginning has been made in the Western style of architecture, especially in the northern part of the city. The sanitary conditions have likewise become improved. There are 7 miles of tramways, and a railway (opened in 1888) to Shah-Abdul-Azim, 6 miles south of the capital. The Ark, or fortified palace of the Shah, in the middle of the city, contains prisons, a military school, beautiful gardens, baths, kiosks, and several other handsome buildings, including the harem. The wealthy citizens dwell in elaborate establishments with gardens and tiny ponds. South of the Ark are the bazars, the centre of the city's life. The town has a library, founded in 1850, a normal school, a military college, and Kings' College, a polytechnic school (1849), with European professors, where Arabic, English, French, and Russian, mathematics, telegraphy, engineering, military tactics, music, and painting are taught. To some of the many mosques are attached madrassehs (colleges). The mosques called Masjid-i-Shad (mosque of the King), with a beautiful enameled façade, the Masjid-i-Madar-i-Shah (mosque of the King's mother), and the Masjid-i-Sipahsalar deserve mention; all of them are modern. There are many baths, Mohammedan and Armenian, the Europeans using the latter. During the summer, on account of unhealthfulness and intolerable heat, the embassies and the wealthier inhabitants move to the mountain slopes.

Water is furnished by underground canals from the mountains. The supply, though abundant, is not regulated, because of private ownership of many canals, and the city accordingly suffers from a lack of water in summer and a superfluity in winter. Irrigation is thus provided, however, and the surrounding country has become highly productive. Teheran manufactures cotton, linen, carpets, shoes, hats, and ironwork, but is not a leading centre of manufacturing. It has, however, an important general caravan trade. An excellent highway 217 miles long, constructed by Russian capital, and completed in 1899, extends from Resht on the Caspian to Teheran. The latter is also connected by carriage road with Kom, 91 miles. To the south of the city lie the ruins of Rei, the birthplace of Harun al Rashid, known in the time of Alexander the Great as Ragæ, the Rhages of Scripture, the capital of Parthia. The population is greatest in winter, when it probably reaches about 280,000, including about 4000 Jews, 4000 Armenians, 600 Europeans, and a garrison of 3000 to 4000.

TEHRI, tā′rē, or, more properly, GARHWAL. A native state of British India included territorially in the United Provinces of Agra and Oudh (Map: India, D 2). It borders upon Tibet, and lies wholly within the Himalaya, around the sources of the Ganges, being a highly elevated and rugged mountain region. Area, 4180 square miles. Pop., 1901, 268,885; 1911, 300,819. Capital, Tehri.

TEHUANTEPEC, tȧ-wän′tȧ-pĕk′, ISTHMUS OF. The narrowest portion of Mexico as well as of the American continent north of Costa Rica (Map: Mexico, M 10). It stretches in an east and west direction between the Gulf of Campeachy, an arm of the Gulf of Mexico west of Yucatan, on the north, and the Gulf of Tehuantepec, an arm of the Pacific Ocean, on the south. Its least width, from Coatzacoalcos to the head of the Lago Superior, is 120 miles. The plateaus of Mexico and Guatemala are here separated by a depression falling to an altitude of 680 feet. This fact as well as the geographical position of the isthmus has led to numerous plans and projects for some means of interoceanic communication at this point, including a possible scheme for a ship canal. A railroad of standard gauge and 150 miles long was built across the isthmus by an English firm and was opened in 1907. It is operated under a partnership between the Mexican government and the constructing company. Its terminal ports are Puerto Mexico (Coatzacoalcos) on the Gulf and Salina Cruz on the Pacific.

TEHUELCHE, tȧ-wĕl′chȧ. A general term for several different Patagonian tribes. There is evidence that the Tehuelches are immigrants from more northern portions of South America, but their origin is doubtful. They occupy a relatively small territory between the Strait of Magellan and the Santa Cruz River. They are considered the tallest of human races. Accurate observations on this point are few, but the average stature of male Tehuelches is about 1.75 m. They are also very brachycephalic in head form. In culture they are low. Consult Masters, *At Home* *with the Patagonians* (London, 1871), and Lista, *Viage al pais de Tehuelches* (Buenos Aires, 1878).

TEIAS. See Teja.

TEICHNER, Heinrich der. See Heinrich der Teichner.

TEIGNMOUTH, tĭn′mŭth. A seaport and watering place on the south coast of Devonshire, England, situated on the English Channel, at the mouth of the Teign, 15 miles south of Exeter (Map: England, C 6). There is a considerable sea and river fishery. An average of 1200 small vessels clear the port annually. The town received a market grant from Henry III. It was burnt by the Danes in 970 and by the French in 1340 and 1690. Pop., 1901, 8636; 1911, 9215.

TEIGNMOUTH, John Shore, first Baron (1751–1834). An Anglo-Indian statesman. He was born in London, was educated at Harrow, and in 1769 entered the civil service of the East India Company. From 1775 to 1780 he was a member of the revenue council at Calcutta, and was appointed by Warren Hastings one of the committee of revenue which superseded the council. After a visit to England in 1785–86 he returned to India in 1787 as a member of the supreme council of Bengal. The organization of the revenue and judicial systems of Bengal and the measure on *Zamindari* proprietorship of the soil which was ratified by Lord Cornwallis were largely due to Shore's initiative, and on Cornwallis' retirement in 1793 Shore was made Governor-General of India. He was created a baronet in 1792. On his retirement in 1798 he was raised to the peerage as Baron Teignmouth. He wrote *Memoirs of the Life, Writings, and Correspondence of Sir William Jones* (1804). Consult C. J. S. Teignmouth, *Life and Correspondence of John Shore, first Baron Teignmouth* (2 vols., London, 1843).

TEISSEIDRE, François Louis. See Fleury, Marquis de.

TEISSERENC DE BORT, tā′s'-rän′ d*e* bôr′, Léon (1855–1913). A French meteorologist, born at Paris. He was in the government service from 1882 to 1890, when he resigned to do experimental work. He fitted out the *Otarie*, which made fruitful cruises in the Mediterranean and the tropical Atlantic. At the meteorological observatory which he established at Trappes (Seine et Oise), many important discoveries in aërology were made. His work was several times crowned by the Academy of Sciences, to which he was elected in 1910. Most of his writings appeared in the *Annales du bureau central météorologique*, but he published, besides, *Distribution de nébulosité à la surface du globe* (1884); *Etude de la synthèse sur la répartition des pressions à la surface du globe* (1887); *Mesure des hauteurs des nuages par la photographie* (1895); *Etude de l'atmosphère marine par sondages aériens* (1909).

TEIXEIRA DE MATTOS, tā-shā′rȧ dȧ măt′tôs, Alexander Louis (1865–). An English journalist, born at Amsterdam. In 1874 he settled in England, and later was London correspondent for Dutch newspapers. He served as editor of *Dramatic Opinions* in 1891, and as assistant editor and editor of the *Candid Friend* in 1901–02. He became widely known for his translations from the Danish, Dutch, Flemish, French, and German, and especially for those of Maurice Maeterlinck, Carl Ewald, Maurice Leblanc, and J. H. C. Fabre (qq.v.).

TE′JA, or **TEIAS.** The last King of the Ostrogoths. He was chosen King after the death of Totila (q.v.), who fell in battle against the Byzantines under Narses, at Tadino, 552 A.D. The Gothic Kingdom received its deathblow in that battle and it was left to Teja only to prolong the hopeless struggle. He sought to gain the aid of the Frankish King Theudebald, but failed. While marching to the relief of Cumæ he was met by the Imperial army under Narses and thereupon took up an impregnable position near the foot of Mount Vesuvius, where the Goths were invested by the enemy. After two months want of food compelled the Goths to abandon their position and they retired to the Lactavan Hill, whence they made a desperate onslaught on the Romans. In the two days' battle Teja perished after performing wonderful deeds of valor (553). The remnant of the Goths were permitted to leave Italy. Consult *Cambridge Medieval History*, vol. ii (New York, 1913). See Goths.

TEJADA, tā-hä′dȧ, Lerdo de. See Lerdo de Tejada.

TEJEND (tĕj′ĕnd) **RIVER.** See Heri-Rud.

TEJON, tā-hōn′. The Mexican name of the local species of badger (q.v.).

TEJU, t*ĕ*-yōō′ (abbreviation of *Tejuguacu*, the native name). A large and powerful South American lizard of the family Tejidæ, and especially of its principal genus, *Tupinambis*. This family comprises nearly 40 genera with more than 100 species, and exhibits great diversity, from its wide range, covering all South and Central America, the West Indies, Mexico, and the southwestern United States. The largest of the family (*Tupinambis teguexin*) is 3 feet long to the end of its long, terete, tapering tail; is bluish black with irregular yellow crossbands, and reddish yellow underneath. They frequent woodlands and plantations, living in burrows. They are carnivorous and are able by swiftness and agility to capture small animals.

TEKELI, tĕk′ĕ-lĭ. An Hungarian patriot. See Tököly.

TEKIYÉ, tā-kē′y*e*. A Mohammedan monastery inhabited by dervishes (q.v.) or other ascetics. The larger tekiyé are built about an arcaded court, beyond which are the chambers, sometimes covered with domes; the smaller examples are often mere ordinary houses. Well-known examples are the tekiyé of the whirling dervishes at Pera, that of the howling dervishes at Scutari (Constantinople), and the one built near Damascus by Sultan Selim I in 1516.

TEKNON′YMY (from Gk. *τέκνον*, *teknon*, child + *ὄνυμα*, *onyma*, *ὄνομα*, *onoma*, name). A custom found among certain savage groups whereby a father (in some cases both parents) after the birth of a child is known as the parent of so-and-so. The custom is seen most completely developed in Java, Sumatra, Borneo, Celebes, and the neighboring islands. It is also found among Arabs and Persians, in Alaska, among the Cree, Hopi, and Zuñi of North America, in Oceania, Australia, and South Africa. The more commonly accepted explanation of the custom is that the assumption by the father of his child's name is an assertion on his part of his fatherhood and is indicative of the growth of the patriarchal idea. Another view is that it is the result of migration, the children of immigrants who have intermarried with older resident populations, forming a natural bond between the two distinct races, wherefore the strange names of their fathers would be supplemented by expressions simply designating them as the parents of their offspring. The probabilities are that a number of customs of diverse origin are included under the term. Consult E. B. Tylor, in *Journal of the Anthropological Institute*, vol. xviii (London, 1889), and W. H. R. Rivers, *The History of Melanesian Society*, vol. i (Cambridge, 1915).

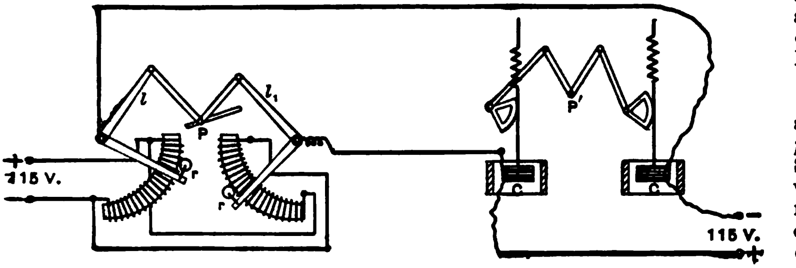
TEKUTCHIU, tâ-kōō′chê. A town of Rumania. See Tecuciu.

TEL′AMON (Lat., from Gk. *Τελαμών*). In Greek mythology, the son of Æacus. Having been driven out of Ægina (q.v.) for helping Peleus (q.v.) to kill their half brother Phocus, he married Glauce, daughter of the King of Salamis, and became King of the island. He was the father of Ajax the Greater (see Ajax), took part in the hunt of the Calydonian Boar (q.v.) and the Argonautic expedition (see Argonauts), and went with Hercules (q.v.) against Troy and the Amazons.

In architecture the term is, for some obscure reason, often applied to male human sculptured figures supporting entablatures, balconies, or the like, more often and more properly called atlantes. See Atlas.

TELANG, tĕ-läng′, or **TELANGA**, tĕ-län′gȧ, Kashinath Trimbak (1850–93). A Hindu judge. He was born and educated at Bombay. In 1872 he was enrolled as a barrister. In 1881 he became a syndic of the University of Bombay, and in 1889 was appointed to a seat on the high-court bench. In 1892 he became vice chancellor of the university and president of the Bombay branch of the Royal Asiatic Society. Among his works may be mentioned the translation into English prose and verse of the *Bhagavad-Gita* (q.v.) in the "Sacred Books of the East," vol. viii (1898), and a criticism of Weber's theory that the *Ramayana* (q.v.) showed Homeric influence. He edited the *Nīti-* and *Vāirāgya-çatanas* (1874) of Bhartrihari (q.v.), and the *Mudrārākṣasa* (1884) of Viśakhadatta (q.v.). He also translated into Marathi (q.v.), his native dialect, Lessing's *Nathan the Wise* and an essay on *Social Compromise*.

TELAU′TOGRAPH (from Gk. *τῆλε*, *tēle*, afar + *αὐτός*, *autos*, self + *γράφειν*, *graphein*, to write). An autographic writing telegraph invented by Elisha Gray. This system comprises a transmitter, receiver, and circuit connections. A typical station equipment is shown in the illustration. Two wires are employed to connect transmitting and receiving stations. The operating mechanisms and simple circuit connections, not inclusive of the announcing buzzer and inking details, are shown in the diagram. At the transmitter, the pencil *P* is attached by lever, *ll₁*, to two circuit contact rollers, *rr*, which bear against the surface of two inversely placed horn-shaped rheostats. The transmitted current from each rheostat varies with the position of its respective roller, such position shifting with motion of the sending pencil. These varying currents are led by circuits to coils, *CC*, at the receiving instrument; these are wound on copper bobbins and suspended in strong uniform magnetic fields. As the transmitted current varies in size owing to shifting of the pencil at the transmitting station, the coils shift their positions. The pen, *P′*, of the receiver is attached to the arms of crank levers, which are in frictional contact with the supports of coils, *CC*. Thus, as the coils shift position owing to the change of current in them, the resulting motion of the pen corresponds to that of the sending pencil and the handwriting of the operator is reproduced. This device is quite extensively employed in banking houses, department stores, clubs, and government offices for the transmission of orders or instructions from one department to another.



TELAV, tyĕ-läf′. An old district town in the Government of Tiflis, Russian Transcaucasia, 63 miles east-northeast of Tiflis (Map: Russia, G 6). It was formerly the capital of Kachetia and has ruins of old palaces. Pop., 1910, 15,231, chiefly Armenians and Georgians.

TELEDU, tĕl′ĕ-dōō. See Badger.

TELEG′ONUS (Lat., from Gk. *Τηλέγονος*). The son of Ulysses (q.v.) by Circe (q.v.). Having been sent to Ithaca to find his father, he failed to recognize him in combat and slew him, afterward taking the body home, together with Telemachus (q.v.) and Penelope (q.v.), whom he married. He was looked upon as the founder of the Italian cities Tusculum (q.v.) and Præneste (q.v.), and, through his daughter Mamilia, as the ancestor of the Roman Mamilii. His story is the theme of the *Telegonia* or *Telegony*. See Cyclic Poets; Trojan War.

TELEG′ONY (from Gk. *τῆλε*, *tēle*, afar + *-γονία*, *-gonia*, generation, from *γόνος*, *gonos*, seed, from *γίγνεσθαι*, *gignesthai*, to become, to be born). The influence of the first or of a previous sire on the subsequent progeny obtained by other sires. That the first impregnation has a lasting influence has been generally accepted by breeders. Weissmann, however, states that the most competent judges in Germany, such as Stettegast, Nathusius, and Kühn, in spite of their extensive experience in breeding and crossing, have never known a case of telegony, and doubt its reality. See Breeding.

TEL′EGRAPH (from Gk. *τῆλε*, *tēle*, afar + *γράφειν*, *graphein*, to write). Strictly defined the word "telegraph" means to write at a distance, though today the word is employed to designate any means whereby a message is transmitted by signs or sounds other than the spoken word. Thus, generally speaking, the smoke and flame signaling used since biblical times (Ex. xiii. 21), heliographs, semaphores, etc., would be considered telegraphing. However, these devices, discussed under Signaling and Telegraphing, Military, will not be treated in the present article, which deals with the electric telegraph.

History. The earliest reference to the use of electricity for the sending of signals is found in an article in the *Scots Magazine* of February, 1753, which suggested the use of frictional electricity. In 1774 Le Sage of Switzerland constructed a telegraph system about 1 mile long, which comprised 24 line wires, one for each letter, with pith balls suspended at each terminal, utilizing the well-known phenomenon that light substances are repelled upon electrification. Through the use of frictional electricity applied at the sending end of the wires, Le Sage succeeded in transmitting intelligible signals to the receiving end. Francis Ronalds later (1815) devised an alphabetical telegraph system which also employed frictional electricity as the actuating agent. Synchronously rotating dials were placed at the sending and receiving terminals, and back of these dials the letters of the alphabet were arranged in a circle. A slot was cut in the face of each dial through which, as the dials rotated, the letters of the alphabet could be seen. Upon a certain signal the rotating mechanisms of the dials were set in motion, and as the windows exposed a desired letter the current was applied, and pith balls suspended at the terminals of a wire connecting the stations were caused to swing; in this manner the message was spelled out. In 1839 DeHerr of Holland proposed a system employing the physiological effect of the electric current. In this scheme 10 wires were employed between two stations. At the receiving end the operator placed his fingers and thumbs on the 10 terminals respectively, and with the passage of the current in a predetermined manner the shock would indicate the message sent. Telegraph systems depending upon the use of frictional electricity are, however, very uncertain on account of the great leakage of current and their extreme sensitiveness to atmospheric conditions.

Allesandro Volta (q.v.), professor of physics at Como, discovered (1774) that electricity could be generated by chemical means. Following this, several more or less successful attempts were made between 1806 and 1830 to employ the electrochemical action of the voltaic current to record messages. Dyar's recorder of 1826 employed the action of electric currents on iodine solutions as a means of recording messages.

Oersted (q.v.) of Copenhagen (1820) made the great discovery that a magnet needle would be deflected from its normal position when placed parallel to a wire conveying an electric current, and, further, that the deflection was to the right or left, depending upon the direction of current flow. Employing a coil of wire within which the magnetic needle was suspended, the effect is multiplied and a sensitive current-indicating device or galvanometer (q.v.) is produced. Following this epoch-making disclosure, many needle-telegraph systems came into existence and were at one time extensively employed in Europe, those of Gauss and Weber in Germany and of Wheatstone and Cooke in England being the most important. Sturgeon in England (1824) discovered that when a current of electricity was caused to flow in a coil of insulated wire, surrounding a bar of soft iron, the latter became a strong magnet, and that upon interruption of the current the bar immediately lost its magnetism. Joseph Henry (q.v.) of Albany, N. Y. (1831), set up the first experimental electromagnetic telegraph system, employing as elements a voltaic battery and an electromagnet. It, however, remained for Dr. Samuel F. B. Morse (q.v.) of New York (1837) to invent the telegraph system which in one form or another is the basis of most modern land systems. The apparatus first used by Morse has but slight resemblance to the instrument used to-day. The original Morse relay weighed about 300 pounds, that employed to-day weighs about 3 pounds.

Up to about 1870 the Morse single-message systems were the only practical ones. The duplex method, the sending of two messages simultaneously in opposite directions, was not perfected until 1872 by J. B. Stearns. The diplex, used to send two messages simultaneously in one direction, was invented by Thomas A. Edison in 1873, and the quadruplex system, sending four messages in pairs of two in opposite directions simultaneously, was invented by him in 1874. To-day the duplex, quadruplex, and multiplex systems are extensively used in practice, and the field of electric telegraphy has been extended until it includes municipal fire and police alarm systems, stock-quotation tickers, typewriting and autograph telegraphs, while the submarine telegraph, as first exemplified by Cyrus W. Field's commercial cable, has been in extensive use since 1865.

Practice. The essential elements of an electric telegraph system are: (1) means for producing the electric current—the battery or the generator; (2) means for conducting the electric current—the line wires; (3) means for controlling the duration and sometimes the direction of the current—the key or transmitter; (4) means actuated by the current to indicate or record the messages—sounders, recorders, etc. Thus the art of electric telegraphy consists in the production, control, and organization of electrically actuated signals, these being either visible or audible. Visible signals may be momentary and vanishing, as in the earlier forms of mirror galvanometers, or they may be permanent, as in the case of the Morse register or siphon recorder; whereas audible signals are produced by the sounder or other similar device.

A simple electric circuit is represented in Fig. 1, wherein *W* is the conductor circuit, *B* the electric battery, *K* the transmitting key, and *R* the receiver.

Fig. 1 represents a complete metallic circuit, but since Steinheil (1838) showed that the earth is a good conductor, the dictates of economy lead to the use of an electric circuit for telegraphic purposes, one side of which comprises a copper conductor and the other, the earth, as a return; i.e., a grounded circuit is used, and such a circuit is illustrated in Fig. 2, wherein *B*, *K*, *R*, and *W* have the same significance as in Fig. 1, while *G* and *G'* represent the ground plates. These are copper sheets buried well below the surface in a normally moist soil.

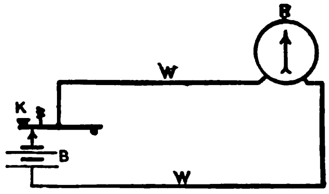


FIG. 1. SIMPLE TELEGRAPH CIRCUIT.

Types of Circuits. There are two general ways in which a telegraph circuit may be arranged. The source of electricity may only be connected to the line when a message is to be sent or the generator may be in the line constantly with a continuous flow of the current along the line, the message being sent by opening the circuit and interrupting the current flow. These methods are known as the open-circuit and the closed-circuit arrangements respectively.

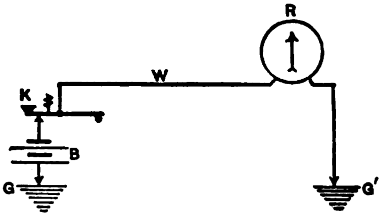


Fig. 2. EARTH-RETURN CIRCUIT.

An open-circuit telegraph line comprising three stations is represented in Fig. 3. Each station is provided with a controlling key, *K*, a battery, *B*, and a receiver, *R*. The receiver and the battery are in different branch lines. When the key, *K*, at any station is up, the normal condition, the receiving device at the corresponding station is in the circuit. When the key is pressed down, the receiving device, sounder, or relay is cut out, and the corresponding battery is placed to the circuit; current then flows over the line wire, actuating the other receiving devices, causing their movable members, the armatures, to be drawn forward. In this arrangement, therefore, each station will transmit signals by inserting its own battery into circuit at the proper intervals, and the current flow thus established actuates the receiving devices at the other stations. This arrangement is not employed in America, but is encountered in European practice.

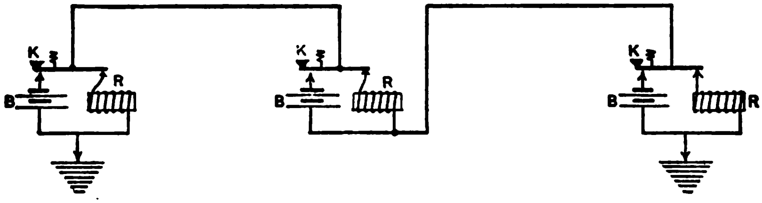


Fig. 3. OPEN-CIRCUIT TELEGRAPH.

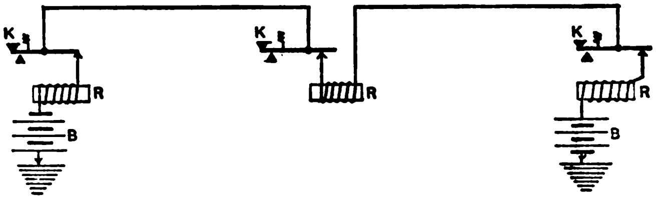


Fig. 4. CLOSED-CIRCUIT TELEGRAPH.

A closed-circuit telegraph line comprising three stations is represented in Fig. 4. In this arrangement a battery need not be used at every station; it may be concentrated all at one end of the line, though a better distribution is obtained if a battery be grouped at each terminal station. The cells of the battery are always in the line, the current passing normally through the rear contacts of the keys and through the receiving instruments at all the stations. The circuit is interrupted by the depression of any of the keys, the current ceases to flow, and a signal is simultaneously given by all the receiving instruments, their levers or armatures being drawn away from the magnets by spring action.

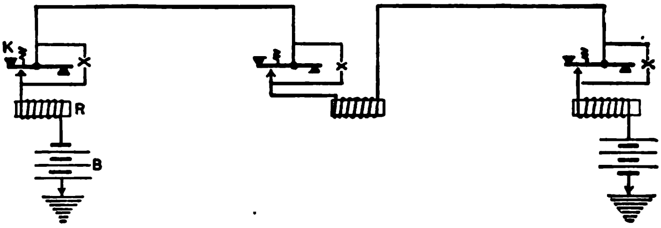


Fig. 5. AMERICAN STANDARD TELEGRAPH CIRCUIT.

The primary advantages of the open-circuit system are that in the case of audible messages, received with a sounder, as described below, the sound is made on the forward stop, which is clearer than that given out by the armature striking the rear stop; also less battery material is consumed because the current only flows when the message is being sent. The closed-circuit system, however, has the great advantages that the line is under constant test, the operator hears his own message, and the battery attendance is simplified, as the power plants are only at terminal stations.

The American modification of the Morse system is shown in Fig. 5. This is the standard arrangement employed in the United States, Canada, and Mexico. It differs from the closed-circuit system in that the current does not pass through the back stop or contact of the operator's key, but through lever contact or plug, as shown at *X*. This is in practice part of the operator's key (Fig. 6). To send a message by the American modification, the circuit is first opened by removing the plug at *X*, and the signals thereafter are made by depressing the key to close the circuit at the front stop. This system has the main advantages of both the preceding arrangements. It has, however, a serious weakness of its own, viz., an operator may fail to close the circuit at *X* after completing his message. This leaves the system inoperative, just as much as though the line itself had been broken. Many automatic schemes have been suggested to remedy this, but the most effective protection has been dismissal of the individual who failed to close up the line.

A typical Morse key of the Bunnell type is shown in Fig. 6. *A* is the lever between the trunnions *TT;* the lever has a small up and down motion, limited respectively by the set screw *S* at the rear and by the contact points *C* and *C′* at the front. The circuit leads go to the binding posts *PP′*. The circuit is normally closed by the side lever *X*, making contact with the tongue attached to *C*. When the operator wishes to send a message, *X* is pushed away from *C* and the circuit made by pressing down on *A* to make *C* and *C′* come into contact.

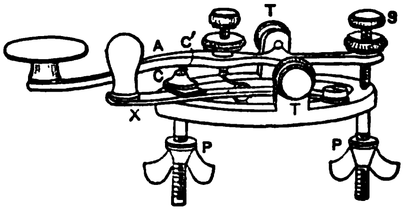


FIG. 6. AMERICAN TELEGRAPH KEY.

Code. The message is transmitted by the duration of time of contact between *C* and *C′*. The Morse code was devised by Alfred Vail (1837) and is made up of a combination of elements: the dot, the dash, the ordinary space, the letter space, the word space, and the sentence space. The dash is equal to two dots in duration; the ordinary space is equal to the dot in duration; the letter space is equal to two dots in duration; the word space is equal to three dots, and the sentence space is equal to five dots. The typical codes are shown herewith (Fig. 7). The Morse code is used in America; the Continental on cable work, wireless, and in Europe and in all countries except those of North America.

AMERICAN MORSE CHARACTERS

·	E	—	T
··	I	— —	M
···	S	— — —	5
····	H	⸺	L
·····	P	⸻	cipher
······	6		
·—	A	—····	8
··—	U	—·	N
···—	V	—··	D
····—	4	—···	B
· ·	O	— —·	G
· ··	R	— — —·	!
· ···	&	— —· ·	7
·· ·	C	·— —	W
··· ·	Z	·— —·	1
·· ··	Y	· ·— —··	"Period"
·—·	F	—·—	K
··—·	Q	—·—·	J
···—·	3	·—·—	"Comma"
·—··	X	—··—	9
··—··	2	—··—·	?

CONTINENTAL MORSE ALPHABET

·	E	—	T
··	I	— —	M
···	S	— — —	O
····	H	— — — —	Ch
·—	A	—·	N
·— —	W	—··	D
·— — —	J	—···	B
··—	U	— —·	G
···—	V	— —· ·	Z
·—·	R	—·—	K
·—··	L	—·—·	C
·— —·	P	—·— —	Y
··—·	F	—··—	X
		— —·—	Q
1, ·— — — —		6, —····	
2, ··— — —		7, — —···	
3, ···— —		8, — — —··	
4, ····—		9, — — — —·	
5, ·····		0, — — — — —	
Period, ·· ·· ··		?, ··— —··	
Comma, ·—·—·—		!, — —·— —	

FIG. 7. MORSE ALPHABETS.

Sounder. A typical sounder is shown in Fig. 8. In this the lever or armature *A* is attracted by the magnet *E* when the current flows through the winding. The motion of the armature is adjusted between the stop limits *L* and *L′* and the strength by the spring *S*. In the open-circuit and American modification the signal dot or dash is given by the point of the stop *L′* striking the frame *B* on its downward stroke. On short-line circuits 40 to 50 miles in length the sounder may be directly in the main circuit; in such cases the magnet coils of about 1800 turns have a resistance of about 20 ohms, and a current of about 0.125 ampere is needed to actuate it.

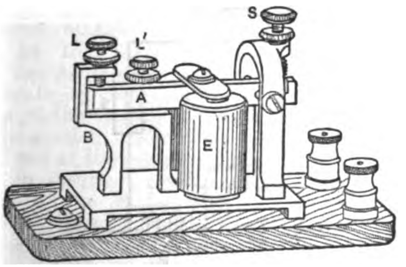


FIG. 8. SOUNDER.

Relay and Local Circuit. When the line is of considerable length and resistance, and its insulation only fair, it is most difficult to maintain a current sufficiently strong to actuate a main-line sounder. This is overcome by introducing an auxiliary receiving instrument, the relay, into the main line (Fig. 9). The armature is very light, and so delicately balanced that only a small current is required to actuate it. However, owing to the lightness it does not give out a clear sound, hence it is employed to open and close a local circuit in which the sounder is located. The line current needed to actuate such a relay is about 0.02 ampere; the local circuit contains one or two cells, the local sounder and connections; while the current in the local circuit to actuate the sounder is about 0.25 ampere.

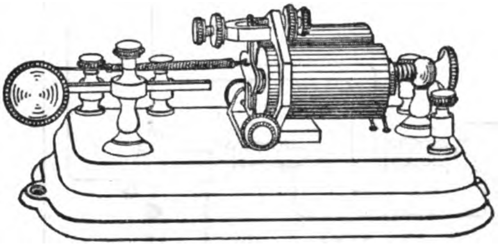


FIG. 9. RELAY.

Way Station. The simplest combination of apparatus is that employed at an intermediate or way station of a single-line circuit. It comprises a key, relay, local battery, sounder, lightning arresters, protector fuses, and the various connecting wires. The arrangement of the apparatus is represented in Fig. 10.

Telegraph Line. Telegraph lines while originally of iron wire, are now generally of copper, varying from 0.1″ diameter (No. 10 B. and S. gauge) to 0.14″ in diameter (No. 7 B. and S. gauge). The line wires are carried on wooden poles, spaced about 20 to 40 per mile, depending upon the nature of the country. At each point of support the line wires are attached by a loop to an insulator on a cross arm. The function of the insulator, usually of glass in the United States and earthenware or porcelain in other lands, is to prevent, in so far as possible, the leakage of current to the ground. A typical telegraph line insulator is shown in Fig. 11.

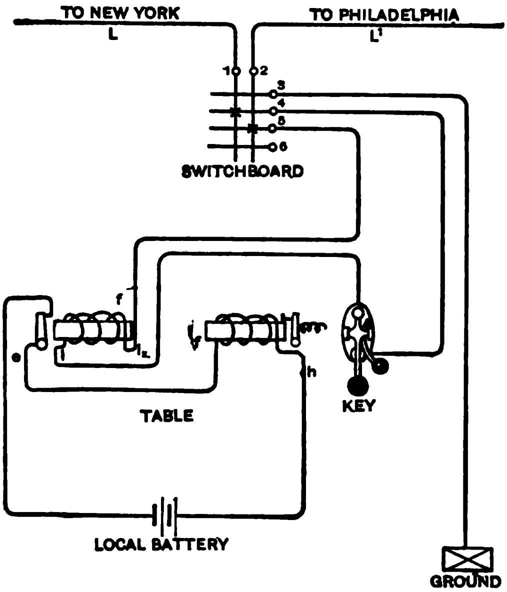


FIG. 10. SINGLE-LINE WAY STATION SHOWING RELAY.

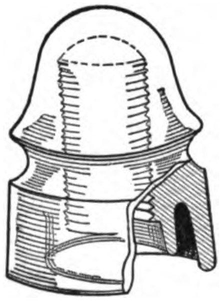


FIG. 11. TYPICAL AMERICAN GLASS INSULATOR.

The length of a continuous telegraph circuit which may be operated satisfactorily depends upon the resistance of the line, the effectiveness of the line insulation, the weather conditions, the number of way stations through which the line loops, the mode of sending, and the speed of operation desired. The difficulties arising from defective insulation necessitate shortening the line. The greater the continuous length of the line, the slower the speed with which the message can be sent. Thus it has become the practice to divide long telegraph lines into sections of 300 to 500 miles, repeating the message from one section to the next. This was formerly done by an operator but is now performed by a device or instrument called the repeater.

Repeater. Repeaters are simply combinations of electromagnetic devices in which the relay receiving signals through one section opens and closes the circuit of the next section in the manner that a relay opens and closes a local circuit. The combination must, however, so function that the repeating of messages from one section of line to another may be performed in either direction. There are many forms of automatic repeaters. A very simple and effective one is the Toye repeater (Fig. 12). This comprises two relays, R_e and R_w, two transmitters, T_e and T_w, two terminal batteries, B_e and B_w, two rheostats, S_e and S_w, various wire connections, local batteries, etc. By reference to Fig. 12 it will be seen that when the distant eastern operator opens his key to prepare to send a message to the west, the relay R_e will become demagnetized, its lever arm falls away and opens the local circuit, controlling the western transmitter T_w. As this transmitter becomes demagnetized, its armature is drawn up at the inner end by a spring and the western line is opened between the post P and the tongue t. When this occurs, if it were not for a preventive feature, the western relay at the repeater station would also become demagnetized, its lever armature would fall away, opening its local circuit containing the transmitter winding T_e, which action would in turn open the eastern line at the corresponding tongue and post, with the result that the whole line would be as inoperative as though the wires were down. In the Toye arrangement relay R_w is prevented from opening by the fact that the western battery when not connected to the main line is given a path to earth, through S_w by way of the tongue and lip of T_w, thus holding closed the local circuit of R_w, controlling T_e. When the distant eastern operator closes his sending key to transmit a dot or dash, the relay R_e becomes magnetized, its armature is drawn forward, and the local circuit controlling T_w is closed, the western battery being placed to the western line by post P, making contact with tongue t and the current impulse of duration desired sent out along the western line. When a distant western operator transmits east, the action of the relays and transmitters is the converse of the action described above.

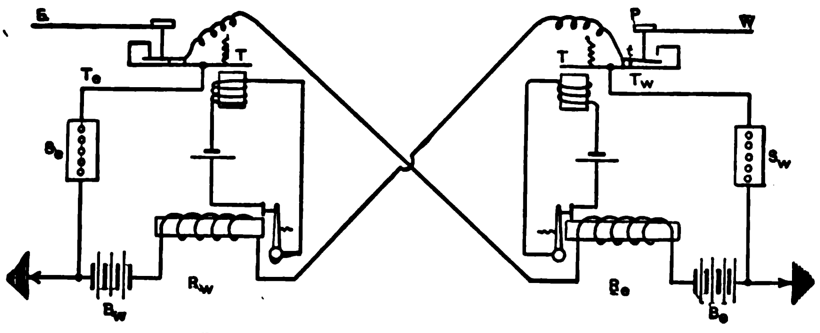


FIG. 12. DIAGRAM OF CIRCUIT OF TOYE REPEATER.

Multiplex Telegraphy. Within a generation from the commercial introduction of the telegraph the multiplication of wires on the principal lines became so marked as to be seriously objectionable. To correct this difficulty and to increase the earning capacity of through lines, the multiplex systems of telegraphy were devised. The most generally useful are the duplex or contraplex, the diplex and the quadruplex.

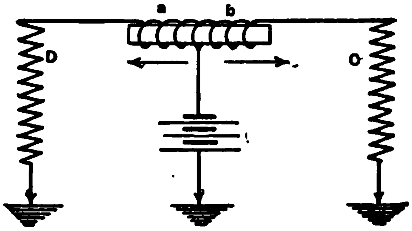


FIG. 13. DIFFERENTIAL RELAY.

Duplex Telegraphy. There are two systems of duplex telegraphy, viz., the differential and the bridge. The former is used in America and the latter in Europe, particularly in England; it is also to some extent employed in connection with submarine-cable working. (See TELEGRAPHY, SUBMARINE.) The differential duplex makes use of the differential relay, and the principle is shown in Fig. 13. The battery current divides equally between the similar branches *C* and *D*, the two equal parts passing in opposite directions through the two windings *a* and *b* respectively; thus the core of the relay is not magnetized when the key is closed. The resistance *C* represents the line and apparatus at the distant station, and that at *D*, the artificial line, is equal in resistance and electrostatic capacity to *C*. The connections of a Stearns duplex system are shown in Fig. 14. The key at the home station actuates the relay at the distant station, while the home relay is caused to operate by the opening and closing of the sending key at the distant station. The keys employed are of the continuity type, so as to insure a constant line resistance, the battery not being removed until the resistance replaces it. A second form of differential duplex is known as the polarized duplex. This employs polarized differential relays, and instead of responding to changes in current strength these are actuated by reversal of current direction.

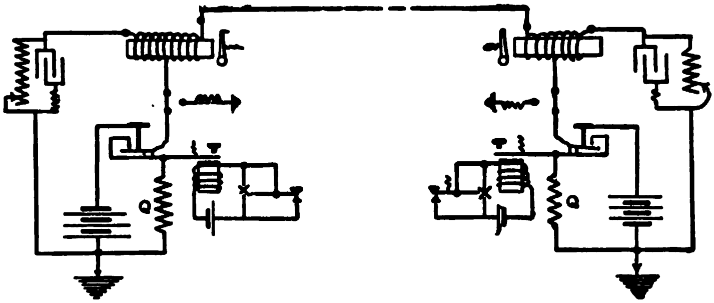


FIG. 14. STEARNS DUPLEX SYSTEM.

The principle of the bridge duplex is illustrated in Fig. 15. The four resistances *a*, *b*, *c*, and *d* constitute the four arms of a Wheatstone bridge, and no current of the home battery flows through the home relay when the local key is closed, the points *x* and *y*, across which the relay is placed, being of the same potential. The resistance *c* represents the line and distant-station apparatus, while *d* represents an artificial line balancing the line *c*, in all respects. An actual arrangement of the bridge duplex is illustrated in Fig. 16.

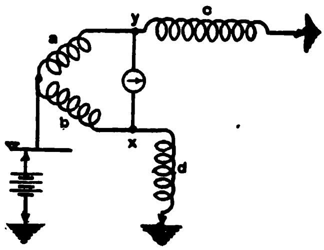


FIG. 15. PRINCIPLE OF BRIDGE DUPLEX SYSTEM.

Diplex Telegraphy. This system of telegraphy depends upon the use of two forms of relays, viz., the ordinary or neutral relay, provided with a stiff spring, and a polarized relay, the armature of which responds only to reversals of current. The adjustment of the two relays is such that the neutral one requires for its actuation three to four times as much current as the polarized one. The general arrangement of a polarized relay is shown in Fig. 17. It comprises an ordinary electromagnet, with its soft iron cores mounted on one pole of a U-shaped permanent magnet and a light iron lever, *L*, pivoted at *P*. This light lever is given a definite polarity inductively by the permanent magnet. When current flows through the coils of the electromagnet, one of its poles, say N_1, is greatly strengthened and attracts *L*; if, however, the current is reversed, the other pole, N_2, is strengthened and will attract *L*. Accordingly, lever *L* is attracted towards N_1 or N_2, depending upon current direction, and consequently it may be used to open and close a local circuit in response to reversals of the line current. A general arrangement of the diplex circuits is shown in Fig. 18. This comprises the battery, the intensity key, K_1, the pole-changing key, K_2,

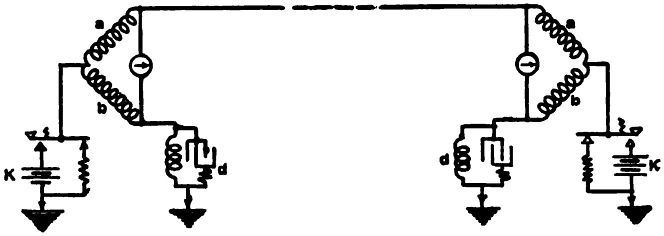


FIG. 16. BRIDGE DUPLEX SYSTEM ARRANGEMENT OF CIRCUIT.

at the home station, as well as the neutral and polarized relays, *N* and *P*, at the distant station, the local sounders are not shown. The action is as follows: The neutral relay responds to increase of current strength by the intensity key, K_1, cutting out the added resistance, R_1, while the polarized relay responds to reversals of current upon manipulation of the polarity key, K_2. To prevent the operator from dragging his message or from holding the keys in a midway position, which would be fatal to the diplex operation, the transmitting keys are actuated by electromagnetic means. Diplex telegraphy is seldom, if ever, used per se; its usual appearance is as one of the constituent elements of the quadruplex system.

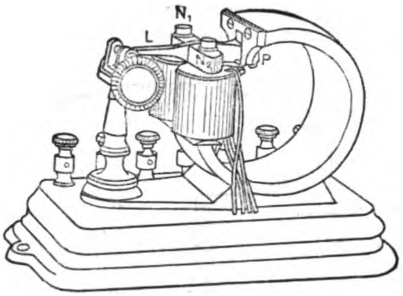


FIG. 17. POLARIZED RELAY.

Quadruplex Telegraphy. The transmission of four messages, two each way, over one line simultaneously is the function of the quadruplex. This is accomplished by making both the neutral and polarized relays of the diplex system of the differential type and combining them in series as in the duplex system. Quadruplex circuits may be of the differential type or they may be of the bridge type. The arrangement of apparatus for the differential form is illustrated in Fig. 19. In this illustration manipulation of the intensity key, K_1, at the home station actuates the neutral relay at the distant station, whereas movement of the home polarity key is duplicated by the action of the polarized relay at the far station.

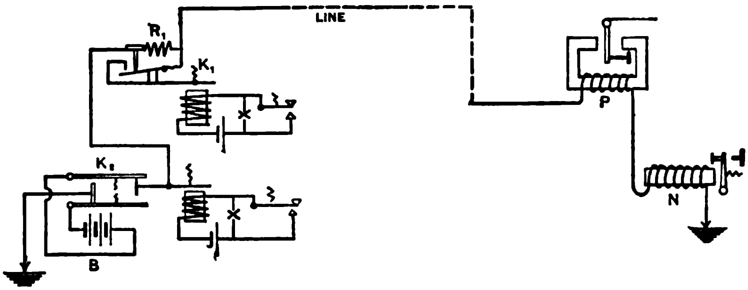


FIG. 18. DIPLEX CIRCUIT.

The repeating of messages over quadruplex lines does not call for special repeating apparatus as in the case of single-message circuits. The adjacent terminal apparatus is cross connected and the intensity relay of one line actuates the polarity key of the next section, while the polarity relay of the first section is employed to operate the intensity key of the second section, and conversely. This transfer from polarity to intensity sides and converse is made to balance up the speed of both sides.

A system of multiplex telegraphy invented by Delany and employed in Europe provides for the simultaneous transmission of a number of messages either in the same direction or part in one direction and the remainder in the opposite direction. The apparatus consists of a number of contact pieces arranged on a circular disk or table, some of which are connected with the separate sending or transmitting instruments, while others are connected with local relays and batteries and the ground. A trailer or rapidly revolving arm connected with the line wire passes over these contact points so that the circuit is successively completed through the different instruments at one station, while a similar device at the other station, revolving synchronously with the first, makes connections with an equal number of instruments. The speed of revolution of the trailers is regulated by two tuning forks or vibrating reeds of the same pitch, and an ingenious synchronizing device keeps them always in unison. In this way it is possible to operate 12 different sets of Morse transmissions over one wire, and it is accomplished in the following manner. The first operator closes his key, and, as the trailer passes around, it will make contact with the line wire and his instrument will be connected about 36 times in one second, thus transmitting that number of impulses. Now, if he desires to send a signal corresponding to a dot, he would close his key for a brief interval, which may be one-twelfth of a second, thus allowing three impulses of current to be transmitted over the line wire to the corresponding instrument at the other station, which is only in a position to receive the signals from the one transmitter. The same is true for the other operators and their instruments, each one employing the wire for a certain fraction of the time.

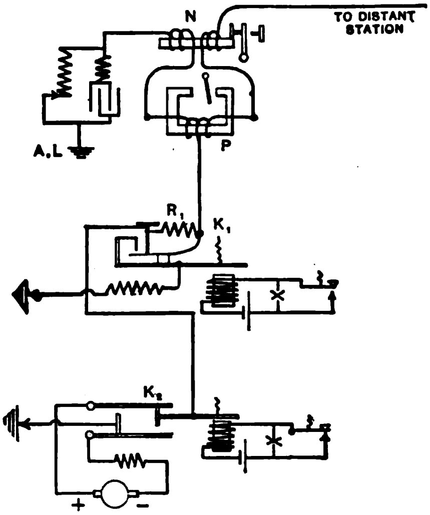


FIG. 19. QUADRUPLEX CIRCUIT—BRIDGE TYPE.

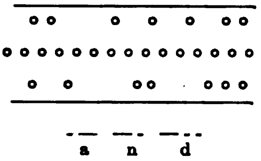


FIG. 20. PUNCHED TAPE FOR WHEATSTONE TRANSMITTER.

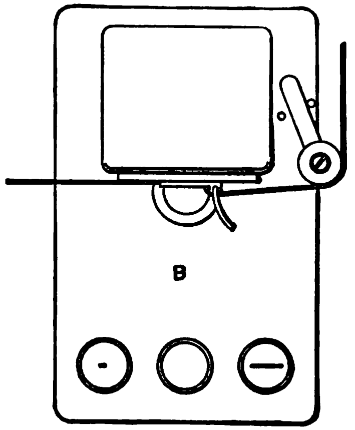


FIG. 21. PUNCH FOR TAPE.

Automatic Sending and Receiving. The speed of transmission of an average telegraph operator is from 30 to 40 words per minute, while the characteristics of both line and receiving apparatus allow of a much greater rapidity. To utilize these possibilities to the utmost, automatic sending and receiving equipments have been devised. One of the most effective of these is known as the Wheatstone automatic, and by its use a message speed of 300 to 400 words per minute may be attained. The message to be transmitted is prepared on a special tape, and this is passed through a transmitter which is a pole-changing switch. The messages are received by means of an inking polarized relay which records the same in Morse code upon a receiving tape. A dot appears on the transmitter ribbon as three vertically spaced holes; a space as one or more small holes along the central line, depending upon the space duration; and a dash is formed by four holes, two space or guide holes and two other holes, one above the first space hole and the other below the second one. A portion of perforated tape is shown in Fig. 20, with corresponding Morse code characters and letters. A tape punch or perforator is shown in Fig. 21, the punch operated by the button at the left forms the dot character, the middle one the space hole, and the right-hand one forms the four holes representing the dash. When the perforator is properly adjusted, 120 guide or centre-line holes are formed per inch of tape. These engage with the points of a star wheel which feeds the tape forward as the characters are punched. The general arrangement of a simple Wheatstone system, though it is also operative in duplex with modifications of connections, is shown in Fig. 22. The sending mechanism is shown at the left and the receiving apparatus at the right. The perforated sending tape is moved to the left over a slotted table, by means of the spur wheel, *W*, and a guide wheel, not shown, serves to press the tape against the table. Rods *P* and *N* pass through holes in guide plate so that they are aligned with the front and back holes on the tape; their longitudinal spacing is the distance between adjacent guide holes. The walking beam, *R*, carrying these upright rods is provided with two projecting pins, *XX*, which limit the upward thrust of rods *PN* as caused by the tension of spring *S*. The crank, *K*, driven by clockwork or motor, which also drives the spur wheel, *W*, rocks the beam through a small arc. The tape is moved forward one space with each down stroke of rod *P*, and the motion of the rods is transmitted to the pole-changing switch, *S*, by the bell crank. A quick snap is given to the switch blade as it passes over the centre position by the flat spring-supported roller; this is done to prevent dragging and sparking at switch contact point *Q*. When the rod *P* is at the top of its stroke, as shown in the illustration, the plus terminal of the battery is connected to line and the negative to ground, while with rod *N* at the top of its stroke the battery connections are reversed. When the sending tape is passing, rods *P* and *N* can travel full strokes only if the holes in the paper are such as will allow them to pass through it. These current reversals, transmitted over the line to the polarized relay, *P.R*, cause the armature of the same to vibrate, and this motion is transmitted to the shaft of the rotating print wheel, *t*. Thus, when the negative terminal of the battery is placed to the line, the action of the relay, *P.R*, is to draw the print wheel against the inking wheel, *i*, and when the plus terminal of battery is placed to the line the relay causes the print wheel to move towards the tape and record a code character thereon; the particular symbol depending upon the lapse of time between current reversals, as controlled by the perforations in the sending tape.

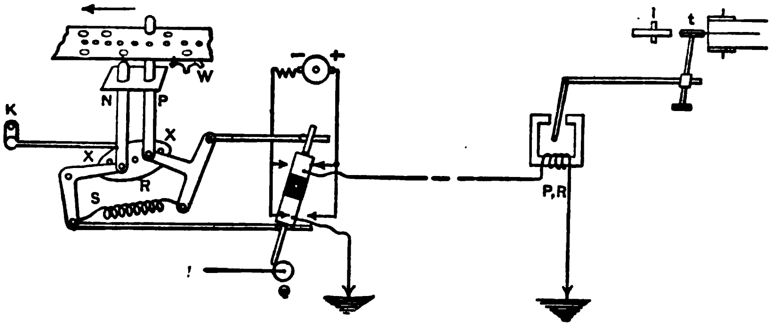


FIG. 22. WHEATSTONE AUTOMATIC TRANSMITTER.

In the Pollak-Virag high-speed telegraph the messages transmitted are reproduced in a kind of italic script. It uses two live wires and an earth return, but, unlike writing telegraphs in general, it does not involve the maintenance of synchronism between the receiver and the transmitter. At the sending end the messages are sent by means of a perforated paper tape which has been previously punched with two sets of holes. The tape is a nonconductor of electricity, and is passed over a roller made up of six electrically insulated sections; and metal brushes, pressing on the roller, form electrical connection with one or another of these sections whenever a perforation comes opposite them. The currents thus allowed to pass vary in intensity, and those from one group of three sections go to one telephone receiver at the receiving end, while those from the other group of three go to the second telephone receiver. To the diaphragms of these two telephone receivers, which are placed close together, a mirror is connected, and is so suspended that it is free to move both horizontally and vertically, in unison with the movements of the diaphragms. Now the perforations which energize one telephone are arranged to represent the vertical motion necessary in writing a character or figure, while the other set of perforations similarly represents the horizontal component. Hence the two telephones together reproduce these components, and the result is that under their combined influence the mirror moves in such a way that its motions mark out the complete characters. These motions are imperceptible directly to the eye, but when a pencil of light is permitted to fall on the mirrors the movement of the reflected ray of course increases in amplitude as the surface upon which it is received is further and further removed from the mirrors, so that the characters described may be enlarged to practically any size. At the point where the size is as large as desired, the reflected ray is made to impinge upon a photographically sensitized tape of paper, and so gives a permanent record of its movements.

Ticker or Stock Quotation Telegraphs. These systems usually comprise one master transmitter and a number of receiving instruments, tickers, connected in series; these latter print the message in ordinary type on a paper tape. The various forms encountered in practice differ in details, but the fundamental operating principles are quite similar. In the case of a simple ticker transmitter 26 pins are uniformly spaced in helical arrangement around a metal cylinder; and this is rotated by a small electric motor or clock work acting through friction drive. A bank of 26 letter keys is placed above this cylinder, so arranged that when a key is pressed it intercepts its corresponding pin and stops the rotation of the cylinder. At one end of this cylinder is a commutator arrangement for reversing the battery current 52 times per revolution. This alternating current passes over the transmission line and through the coils of two electromagnets. One of these is of the polarized type, and therefore responds to the current alternations; the other is of the neutral type, with a heavy armature which, on account of its inertia, is not influenced by the alternating current. The armature of the polarized relay acting through a light escapement turns the type wheel in synchronism with the distant transmitting cylinder. When the transmitter cylinder is stopped by the operator pressing down the key, the current-reversing mechanism stops and a steady current passes over the line. The polarized relay also ceases to actuate its escapement, and the type wheel stops at the letter corresponding to that struck by the operator. The steady current flowing actuates the neutral relay, which pushes the paper against the type wheel, recording the letter selected. When the key at the sending station is released, the cylinder again rotates, the alternating current again flows, and the printing wheel rotates in synchronism, as before; at the same moment the neutral relay is released and then actuates the tape-feeding mechanism so that it is moved forward for the next letter.

Autograph or Writing Systems of Telegraphy. There are various forms of writing telegraphs, but probably the most complete is that devised by Elisha Gray, and known in the art as the telautograph (q.v.). There are also various devices for the transmission of drawings and pictures, but few of these have been developed beyond the experimental stage. In most cases they depend upon the varying sensitiveness to light manifested by selenium.

Municipal Telegraphs. Signaling systems are installed in cities and towns to enable rapid communication to fire department and police headquarters. See FIRE ALARM.

American Telegraph Companies. In the United States the telegraph service, excepting municipal alarm systems, is entirely in the hands of private companies. The first company was organized in 1845 under the name of the Magnetic Telegraph Company by Morse supporters and associates. In that year a telegraph line was constructed between Philadelphia and Morristown, N. J., and in the following year it was extended to New York City. In 1856 the Western Union Company was formed by a combination of the Erie and Michigan Telegraph Company with the New York and Mississippi River Valley Printing Telegraph Company. From this time combination and consolidation were carried on, the efficiency of the service increasing. In 1862 a telegraph line across the North American continent was completed and put in operation. In 1885 the Postal Telegraph Commercial Cable system was established by John W. Mackay, beginning with a few wires between the largest commercial centres in the Eastern and Western States and one transatlantic cable. In 1916 this company reached every important city in North America, and it operated seven transatlantic cables, a Pacific cable, and cables to the West Indies. In 1916 there were 26 companies doing business in the United States, but about 98 per cent of commercial telegraph service was handled by the affiliated Western Union and Postal Telegraph Cable companies. The average toll rate per message in 1870 was 75½ cents, the cost of transmission was 51.2 cents. In 1912 these figures were 49 cents and 39 cents respectively. The land-line rates for a 10-word preferred telegram in 1916 varied from 25 cents between points 250 miles apart to $1 for a transcontinental message.

Statistics. The following telegraph statistics were compiled from the United States Senate Document No. 399 and Census Report of 1912.

The lowest charge per message in the large countries as indicated by the table (page 57) is made in France; the maximum charge occurs in the United States. This is due in part, undoubtedly, to the fact that the distances covered in the United States are very much greater, the mileage of wire being more than 5 times as great for the United States. Of the 2,214,000 miles of telegraph circuit in the United States 1,300,000 are operated by railway companies, and about

260,000,000 company messages are handled per annum over these circuits.

TELEGRAPH STATISTICS OF DIFFERENT NATIONS

COUNTRY	Messages	Average charge per message	Number of offices	Miles of line
		Cents		
Austria	20,840	22.5	4,480	143,850
Belgium.......	1,768,725	14.2	1,630	25,400
Denmark......	3,447,547	14.0	560	8,700
France.........	64,287,600	12.0	20,300	421,000
Germany......	58,556,000	18.0	45,850	1,120,000
Great Britain..	93,360,000	17.2	13,550	556,000
Hungary......	12,532,900	25.0	4,620	88,000
Italy...........	17,875,000	19.3	7,660	124,000
Japan.........	29,839,770	12.3	4,290	99,470
Holland.......	6,700,000	15.0	1,390	22,400
New Zealand..	8,513,120	15.7	1,970	39,100
Norway.......	3,360,050	13.4	1,585	32,000
Russia.........	38,000,000	42.0	8,350	425,000
Sweden.......	4,236,000	15.3	2,855	19,600
Switzerland....	5,820,000	17.2	2,880	15,900
United States..	106,582,500	49.0	30,860	2,214,000

Government Ownership. In striking contrast to the system of corporate ownership in the United States is the governmental control of the telegraphs as practiced in Great Britain and other European countries. This is reflected in the low average cost of messages to be noted in the above table. In the various European nations the telegraph is usually combined with the post office, and this has been the rule from the earliest times. In Great Britain, previous to 1870, the telegraph business was controlled by private corporations, but in 1868 a bill was introduced into Parliament, and passed in the following year, whereby the lines and property were acquired by the government at an expense of £6,750,000. In 1869 there were about 7,000,000 messages sent, which increased to 22,459,775 in 1879 and 93,873,000 in 1913. In this last year the receipts from telegraphs were £3,100,000, and a net deficit of £957,566 for telegraph service. With governmental ownership have come improved service and reduced rates. Where in 1870 it cost from 3 to 6 shillings to send a message from London to Dublin, now a message of 12 words can be sent anywhere in the United Kingdom for sixpence. In 1913 the Post Office Department controlled 14,129 telegraph offices, including 2509 railway offices and 11,620 post-office stations.

Bibliography. A. E. Loring, *Handbook of the Electro-Magnetic Telegraph* (4th ed., New York, 1900); A. C. Crehore, *Synchronous and Other Multiple Telegraphs* (ib., 1905); Houston and Kennelly, *Electric Telegraphy* (2d ed., ib., 1906); William Maver, *American Telegraphy: Systems, Apparatus, Operations* (4th ed., ib., 1909); id., *American Telegraphy and Encyclopedia of the Telegraph* (ib., 1911); Donald McNicol, *American Telegraph Practice* (ib., 1913); Harold Pender, editor, *American Handbook for Electrical Engineers* (ib., 1914); Preece and Sivewright, *Telegraphy* (ib., 1914); A. V. von Haskaier, *Testing Telegraph Cables* (3d ed., ib., 1915); Erich Hausemann, *Telegraph Engineering* (ib., 1915); United States Bureau of the Census, *Telephones, Telegraphs, and Municipal Signalling Systems* (Washington, 1915). See TELAUTOGRAPH; TELEGRAPHY, SUBMARINE; WIRELESS TELEGRAPHY.

TELEG′RAPHER'S CRAMP. See NEUROSIS.

TELEG′RAPHONE (from Gk. τῆλε, *tēle*, afar + γράφειν, *graphein*, to write + φωνή, *phōnē*, sound). A device for recording and reproducing sound by means of the transverse magnetization of a steel wire or disk, based on the principle of local magnetization devised by Valdemar Poulsen (q.v.). The essential parts of the apparatus are an ordinary telephone transmitter, to which is connected an electromagnet, between the poles of which a steel wire or disk passes or revolves. Words spoken into the transmitter set up currents of varying intensity, which, passing through the electromagnet, impress upon each point of the wire or disk a transverse magnetization of corresponding strength. The wire or disk can then be made to pass by the poles of the same or a similar electromagnet connected to a telephone receiver, when the varying magnetization of the wire or disk will set up currents of like intensity as produced the magnetization, when the receiver will produce the original speech. Records formed on disks, it was claimed, could be sent through the mails in ordinary envelopes.

TELEG′RAPHY, SUBMARINE. In submarine telegraphy there are many variations from the practice on land lines. (See TELEGRAPH.) The problem involves the transmission of current along a conductor of great length and necessarily small cross section with of course considerable resistance. In a long cable we have to consider the effect of the electrostatic inductive capacity as well as its conductivity. As it takes a perceptible time for a cable of considerable length to be charged and discharged when a current is sent through it, there is a certain limit to the speed of transmission of signals without their becoming confused and unintelligible. This slow speed of operation makes cabling very expensive, and, despite several important inventions, the difficulty has not been overcome. In fact, no submarine cable in a day of 24 hours can transmit more matter than could be read in an hour from ordinary print.

When the first Atlantic cable was used the ordinary Morse code was employed; but it was soon found that the strength of current needed to actuate the Morse receiving apparatus reduced the speed of signaling to one or two words per minute. This retardation of the speed is occasioned by the fact that a cable of several thousand miles, with its core, insulation, and sheathing, constitutes a condenser of considerable capacity. The action upon the current flow through the presence of this condenser is as follows: The instant the battery is connected to a cable a very large current flows, the major part of which goes to satisfy the capacity of the cable, and as the cable becomes charged this current settles to a steady value determined by the ohmic resistance of the line. At the distant end of the circuit a very small current begins to flow almost simultaneously with the connection of the battery, and as the cable becomes charged, this outflowing current rises in magnitude until it attains a steady value approxi-

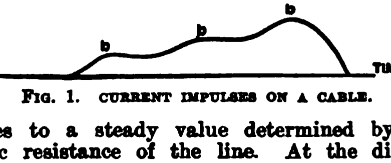


FIG. 1. CURRENT IMPULSES ON A CABLE.

mating the incoming current. When the battery is disconnected the entering current ceases at once, but the outflowing current slowly drops to zero as the charge flows out of the cable. In case the ordinary Morse arrangement of dot and dash were employed to transmit a message per submarine cable, the result obtained would be substantially as shown in Fig. 1. The blocks *a*, *a*, *a* represent three short current impulses impressed upon the cable at the sending end, whereas the cable not having time to discharge between impulses will have an outflowing current as in curve *b*. This outflowing current, not falling to zero between impulses, could not obviously be received by means of an ordinary relay or sounder. Neither could it be accurately read through deflections of a galvanometer. To differentiate clearly between the current pulses on a submarine line, the sending key is arranged to send dots by current impulses in one direction and dashes by current impulses in the opposite direction, the cable being cleared out or discharged between consecutive signals by grounding.

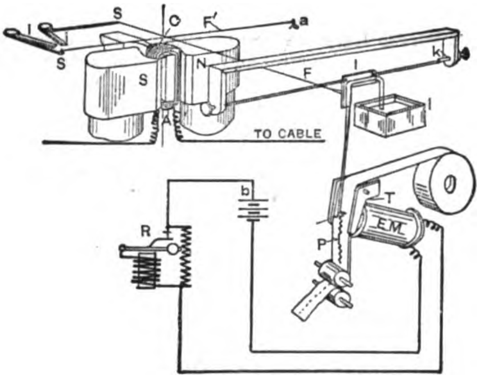


FIG. 2. DIAGRAM OF SIPHON RECORDER.

So faint are the current impulses at the end of a cable of considerable length, even under good conditions, that the reflecting galvanometer (q.v.) or some modified or special form used for receiving signals must be of considerable sensitiveness. The amount and direction of the deflection of the suspended mirror to which the needles are attached depend on the intensity and direction of the current. A galvanometer with a suspended coil, provided it is sensitive enough, may also be used, or, what is more usual, some form of siphon-recording receiver. The siphon recorder was invented by Lord Kelvin in 1867 and has since been greatly modified and improved by various cable engineers.

A typical siphon-recorder arrangement is illustrated in Fig. 2. The galvanometer coil *C*, pivoted on fine agate bearings, is restored to zero by the use of delicate springs *SS*. The siphon consists of a very fine capillary glass tube, several thousandths of an inch in diameter. A small piece of iron is attached to the lower end of the tube, very close to the paper tape *P*, but not in contact therewith. This record tape passes over a magnetic table *T*, which is magnetized by being in contact with the electromagnet *EM*. Magnetic fluctuations or vibrations are set up in the table by means of the vibrator reed *R*, which applies different values of current to the coils of *EM*. When the period of these vibrations has been adjusted by varying the weight of the reed to be the same as the natural period of the siphon, the latter is also caused to vibrate, as would be indicated by a series of fine dots appearing upon the moving tape, and signals are recorded by marks to the right or left of zero. The siphon is connected to the movable coil of the galvanometer through the agency of the delicately mounted cradle *I*, which is caused to rock by the motion of the galvanometer coil transmitted through the fine wire *F*.

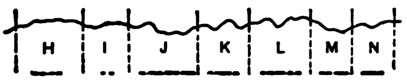


FIG. 3. SPECIMEN RECORD FROM SIPHON RECORDER.

In Fig. 3 is shown a specimen of signals as received over a thousand-mile section of an Atlantic cable. The characteristics as indicated by the underlined dots and dashes represent a part of the International code. (See TELEGRAPH.) To indicate which signals are dots or dashes, it is sufficient that one deflection should climb beyond the other in one direction with only a slight fall between each crest. A change in character of the signal is indicated by a pronounced fall or rise beyond a preceding peak or valley. To produce a signal equivalent to a dot or the letter *e* a positive current is sent through the line and an upward curve is produced on the record. Reversing the current or sending a negative impulse gives the equivalent of a dash or the letter *t*.

The simple key used in sending the signals consists of a pole-changing device by which a current in either direction can be sent over the circuit by simply pressing one of two keys. In automatic transmission, used on the transatlantic cables and other busy lines, the operator first punches in a paper strip holes corresponding to the proper signals. This tape is then fed into an apparatus where, guided by a central line of holes, it is passed through mechanically, and contact is made through the agency of blunt needles or brushes through the holes. These devices, however, can only be used on cables having heavy cores, but by their use a rate of 50 words or more a minute may be obtained.

In working submarine cables it was found as early as 1862 by Cromwell Varley that the sharpness and clearness of the signals was increased and the effect of earth currents eliminated by inserting a condenser (q.v.) of proper capacity between the transmitting instrument and the line. This idea was embodied in a patent in 1862 and put in practice in 1866. When first used at the receiving end it was found that the speed was considerably increased, and when placed at both ends the efficiency of the cable was practically doubled. Greater distinctness in the transmission of the signals was obtained as well as increased rapidity. The operation of a simple cable circuit will be seen from the diagram on page 59.

The cable connected with a condenser at either end is shown above. From the opposite plates of the condenser connection is made with a switch through which the current may pass either to the earth through a galvanometer or recorder or to a transmitting key, *K*, and then to the battery and earth, depending on whether signals are being sent or received at the particular station. At *K* and *K′* either pole of the battery can be connected at will to the line, or rather to the condenser, and the cable charged inductively. The corresponding signals are produced at the distant station, the galvanometer being connected to the line by the switch.

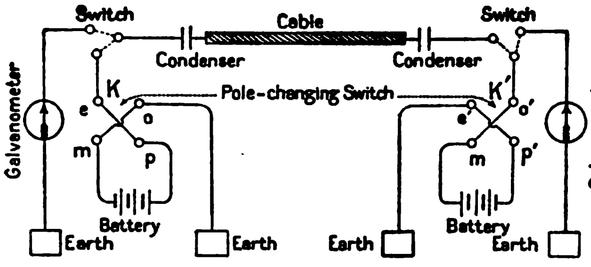


DIAGRAM OF SIMPLE CABLE CIRCUIT.

Duplex Working. Cables can also be worked duplex with facility and messages sent over a single cable in opposite directions. This affords an increased capacity of at least 90 per cent in handling the traffic and is the approved method of working all busy lines. The duplex system was devised in 1873 by J. B. Stearns, and in 1875 and 1876 was improved by Muirhead and Taylor. It was first used on the Atlantic cable in 1878. The connections of one end of a submarine cable for duplex working, which is the normal condition, are shown in Fig. 4, wherein *K* is the sending key, putting the cable to the ground when neither button is pressed, *BR* is auxiliary balancing resistance for fine adjustments, the artificial line substantially equal to the cable in resistance and capacity is indicated as is the siphon recorder, while *C*, *C*, and *C* represent condensers inserted to prevent the earth currents from interfering, which may otherwise produce a wandering zero or disturb the incoming signals.

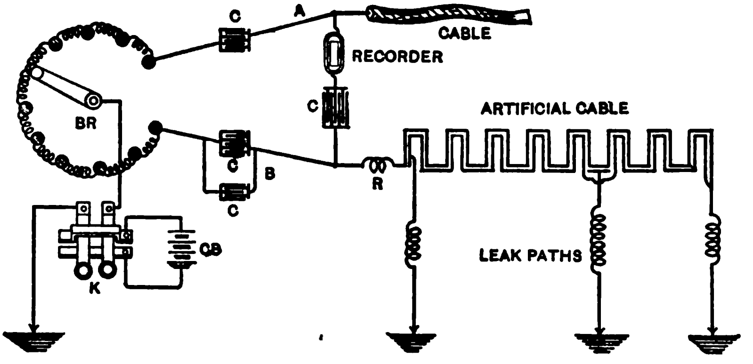


FIG. 4. ARRANGEMENT OF CABLE FOR DUPLEX WORKING.

With duplex work established the next consideration is some form of automatic repeater or relay to transmit signals at intermediate points, e.g., at Newfoundland and Ireland in the line from America to England, or at Honolulu, Midway, and Guam on the route from San Francisco to Manila. These instruments not only must be as sensitive as receivers, but must provide for sending along the signals over a further stretch of cable or telegraph line. The usual types of relays employed over long cables are those of Brown, Heurtley, and Orting. In the Brown drum relay there is a rotating cylinder across which a pointer similar to the ink tube of the siphon recorder may move under the influence of the current in the coil. This pointer normally rests on a central insulated or neutral portion, but as it moves from side to side it establishes contact with a conducting surface through which a circuit is completed with a local battery in a direction corresponding to the swing of the pointer. This of course operates a local transmitting instrument and sends along the signal as received from the first cable over a second cable or land line.

The Heurtley relay, which is used on the Pacific cable to magnify the signals on Fanning Island, especially those from Vancouver Island, resembles a siphon recorder without the paper band driving mechanism and the pen. The movement of the recorder affects a light lever of glass over which a bronze wire is stretched. Normally this fine wire is cooled by an air current, but with any movement of the pointer the wires are moved away from the slit through which the air comes, and the resistance is changed so that the local recorder is affected. In the Muirhead relay, which served to reduce the time of transmission from New York to Buenos Aires from 20 to 3 minutes, and the number of manual retransmissions from 6 to 1, the moving element is a vane which causes a gold wire to oscillate between two contact pegs of gold and silver. In addition to the relays mentioned there are also the vibrating relay of Gulstad used for nearly a quarter century by the Great Northern Telegraph Company, and other types designed by S. G. Brown, which have been used with more or less success, as well as a number for which patents have been secured.

The methods outlined for submarine signaling have involved the use of direct current, with the limitations already discussed. Very early efforts were made to transmit signals by the use of inverse currents to either annihilate the discharge current or at least to diminish it considerably. In other words, this meant the changing of the polarity of successive impulses; and attempts were made to use this fundamental idea as early as 1856. Soon after 1880 a method was adopted of using an inverse current regulated as to its strength and time of duration, so that on short cables an inverse current of only two-thirds the strength of the outgoing current was employed, a polarized relay being an essential feature of the system. The most important system, however, was devised by Picard in 1898, a method that has been used between Algiers and Marseilles, and even between Algiers and Paris, 1120 land miles, of which about one-half was submarine cable. By this method a Baudot type printer was worked over cables 900 kilometers (559.2 miles). By various improvements type-printing apparatus can be worked over nearly 1000 miles of submarine cables. In this system the outgoing impulses are equal in time and are of short duration, and two impulses sent one after another have a contrary polarity. After each impulse the sending end of the cable is insulated. In the Picard method the messages were sent in Morse code, and were received by a very sensitive dynamometer relay, which was connected by a stronger type-printer relay. Various other schemes for using inverse currents were proposed, but with the exception of Picard's work nothing of any considerable importance was done until the invention of the Gott method, whereby ordinary Morse signals could be relayed from a land line to a submarine cable, and vice versa, and a number of sections of lines of various kinds united for direct transmission. In fact signals were sent over this line from Bamfield on the western coast of British America to London, without any manual retransmission. In the Gott method, brought out in 1913 by the Commercial Cable Company, the direction of the current is changed after each signal by the use of a polarized relay of suitable sensitiveness and similar to that employed on land lines. While this method was used with success the taxing of all available facilities of the cables due to the Great War rendered it impossible to perfect the system for continuous commercial use. Attempts have been made to employ alternating currents but without sufficient success to warrant their continued use.

History and Statistics. The feasibility of laying a line for the transmission of signals along the bottom of the ocean seems to have been first suggested in 1795 by a Spaniard named Salvia. Eight years later a nephew of the famous electrician Galvani performed experiments of a similar nature in the deep sea off Calais. The first really important experiments, however, bearing directly upon this subject are believed to have been those of Sömmering and Schilling, who in 1811 applied a soluble insulating material to a conductor which was laid across the river Isar near Munich. These investigators also used a submarine conductor to explode gunpowder by an electric current. In 1813 an Englishman named John Sharpe transmitted signals through 7 miles of insulated copper wire laid on the bottom of a pond, but the first practical attempt to use such a conductor to transmit telegraphic signals was by Colonel Paisley of the Royal Engineers at Chatham, England, in 1838. He surrounded his conductor with strands of tarred rope and wrapped the whole with pitched yarn. In 1839 Dr. W. O'Shaughnessy at Calcutta laid across the Hugli River copper wire covered with bamboo and then coated with cotton and tar. In 1840 Wheatstone proposed a scheme similar to those of the last two inventors, and later suggested the use of gutta-percha as a covering for the wire, but was unable to put his idea into practice. Prof. S. F. B. Morse, of New York, laid an insulated cable between Castle Garden and Governor's Island, and as a result of his experiments came to the conclusion "that a telegraphic communication on his plan might with certainty be established across the Atlantic." The idea that submarine conductors for telegraphic purposes could be constructed was rapidly taking root, and in 1845 the Messrs. Brett, who were active in the construction of the first telegraphic lines across the English Channel and the first Atlantic cable, registered a "General Oceanic Telegraphic Company" for the purpose of establishing telegraphic communication between England and America. In 1850 an experimental line was laid across the English Channel by the Messrs. Brett, and this was followed in 1851 by a permanent cable of such excellent construction that it survived for a number of years. Several longer lengths of submarine cable were laid within the next few years. Italy was connected with Corsica and Sardinia, and Sardinia with Africa. A Black Sea cable was laid in 1855, but operated only a short time.

Thus far attempts to lay submarine telegraph lines had been confined to comparatively short distances. In 1858, after repeated unsuccessful experiments, telegraphic communication was established across the Atlantic. After something over a hundred messages had been sent back and forth, the cable ceased to work. Although this cable was a comparative failure, yet its brief success proved two things: (1) that a cable could be laid through 3000 miles of deep sea; (2) that the electric current could be transmitted through a wire of that length. It was not until 1866 that a permanent cable was laid across the Atlantic. (The detailed history of this undertaking is described under ATLANTIC

THE SUBMARINE CABLES OF THE WORLD TO JAN. 31, 1914

(From *Electrical Trades Directory*, London, 1914)

SUMMARY OF CABLES OWNED BY GOVERNMENT ADMINISTRATIONS	Cables with one or more cores	LENGTH IN NAUTICAL MILES	
		Of cables	Of conductors
Argentine Republic	22	84.000	240.000
Austria	87	713.535	814.000
Bahamas	1	211.000	211.000
Belgium	4	100.900	462.216
Brasil	30	44.441	80.798
British Guiana	8	23.000	50.000
British India	7	1,987.409	1,987.409
Bulgaria	1	0.538	0.538
Canada	51	277.000	277.000
Ceylon and India (Joint)	2	66.000	66.000
China	3	955.400	955.400
Denmark (Telegraphs and Telephones)	147	436.442	1,548.765
France and Algeria	49	3,161.639	3,161.639
France (Principal International and French Colonial Cables)	16	8,479.839	8,479.839
(French) Dahomey and Dependencies	...	1.078	1.078
Germany	97	2,954.178	6,242.049
Great Britain and Ireland	222	3,037.522	9,555.169
Greece	13	59.702	58.818
Holland	32	241.543	780.449
Inter-Colonial System	6	9,279.000	9,279.000
Italy	58	1,738.599	1,892.859
Japan	149	4,248.004	5,076.775
Mexico	6	357.698	434.681
Netherlands (Indies)	17	2,741.900	2,741.900
New South Wales	239	73.996	505.272
New Zealand	36	369.852	375.590
Norway	927	1,555.111	2,576.942
Portugal	4	115.050	115.050
Queensland	22	53.510	56.930
Rumania	...	177.000	189.000
Russia in Europe and the Caucasus	21	928.541	1,058.676
Russia in Asia	1	19.585	58.243
South Australia	3	54.000	54.000
Spain	25	3,129.813	3,129.813
Sweden	26	198.491	363.749
Switzerland	2	10.685	15.057
Tasmania	6	8.500	23.000
Tunis	...	4.312	4.312
Turkey in Europe and Asia	24	365.174	386.759
Uruguay	5	8.954	8.954
Victoria	3	380.995	380.995
Western Australia	3	13.550	23.350
Total	2,375	48,667.486	63,723.074

SUMMARY OF CABLES OWNED BY PRIVATE COMPANIES	Cables with one or more cores	Length of cables in nautical miles
African Direct Telegraph Company	9	3,044
Amazon Telegraph Company	20	1,388
Anglo-American Telegraph Company	18	9,509
Canadian Pacific Railroad Company	10	102½
Central and South American Telegraph Company	22	12,546
Commercial Cable Company	15	17,274
Commercial Cable Company of Cuba	1	1,285
Commercial Pacific Cable Company	6	10,010
Compagnie Française des Cables Télégraphiques	24	11,430
Cuba Submarine Telegraph Company	12	1,540
Deutsch-Atlantische Telegraphen-Gesellschaft	5	9,661
Deutsch-Niederlandische Telegraphen-Gesellschaft	3	3,416
Deutsch Sudamerikanische Telegraphen-Gesellschaft	5	7,386
Direct Spanish Telegraph Company	2	707
Direct United States Cable Company	3	3,194½
Direct West India Cable Company	2	1,276
Eastern and South African Telegraph Company	18	10,538
Eastern Extension Australasia and China Telegraph Company	33	26,219
Eastern Telegraph Company	140	46,613
Europe and Asores Telegraph Company	2	1,060
Great Northern Telegraph Company	30	8,405
Halifax and Bermudas Cable Company	1	851
Indo-European Telegraph Company	3	21
Mexican Telegraph Company	3	2,069
Osteuropäische Telegraphen-Gesellschaft	1	185
River Plate Telegraph Company	4	220
South American Cable Company	7	3,779
United States and Hayti Telegraph and Cable Company	1	1,415½
West African Telegraph Company	8	1,471
West Coast of America Telegraph Company	7	1,973
West India and Panama Telegraph Company	22	4,355
Western Telegraph Company	40	23,835½
Western Union Telegraph Company	9	10,796
	486	237,575
General Summary		
Government Administrations	2,375	48,667½
Private Companies	486	237,575
Total	2,861	286,242½

TELEGRAPH.) A second Atlantic cable was inaugurated immediately after, the one which had broken in the laying in 1865 having been repaired. In 1859, after the first Atlantic cable had ceased to work, the Red Sea and East Indian Telegraph was laid, over a route 3043 miles long, but this also proved a dismal failure and was finally abandoned. The Malta-Alexandria cable was laid in 1861, and was in use till 1872, when, from repeated breakages in shallow water, its use was discontinued. The core consisted of a strand of seven copper wires, covered by three layers of gutta-percha; outside of this was a serving of tarred yarn; and, finally, 18 iron wires constituted the sheathing. This was the first long cable successfully laid (its total length, in three sections, being 1331 miles); and it was also the first properly tested under water before being laid, and carefully constructed with constant watchfulness as to its electrical and mechanical conditions. In 1869 a cable 2328 miles long was laid from Brest, France, to the island of Saint-Pierre, south of Newfoundland; in 1873, one from Lisbon to Pernambuco, Brazil. In 1874 another transatlantic cable was laid, and from that time there have been numerous submarine lines established whose history is discussed under ATLANTIC TELEGRAPH. The Western Union Telegraph Company in 1900 laid a new cable of the heaviest and most improved type between Newfoundland and Penzance, England. In 1914 before the war there were 17 cables operated between the United States and Europe. One of the earliest hostile acts in the war was the cutting of the German cables to America. This left the Teutonic allies without direct service to America and acted greatly to their disadvantage.

In 1902 the British Pacific cable between Australia and British Columbia, 7800 nautical miles in length, was completed, and in 1903 the first American cable was laid across the Pacific, with a length of 7846 nautical miles, by the Commercial Cable Company, between San Francisco and the Philippines. This cable touches at Hawaii, Midway Island, and Guam. Later it was extended from Manila to Shanghai and to Japan by way of the Bonin Islands. In 1914 the total length of submarine cable was stated at 286,242.5 miles, representing an outlay of over $350,000,000.

Construction of Cable. A submarine cable consists of four parts: (1) The central conductor, or core, to carry the current. This is made of copper wire, either solid or in strands. (2) A covering of insulating material to prevent the current from being dissipated. This is usually made of gutta-percha, although for some submarine cables rubber has been used instead. (3) An outer covering to protect the insulating material from injury. This is usually of yarn, tape, or canvas. (4) The sheathing or spiral armoring of steel wires, laid on closely. The cable is generally divided into three sections: the deep-sea section, the intermediate portion, and the shore end. The last portion has to be constructed with greatest care and strength, as in shallow water there is more danger of injury from rocks and other causes. It is estimated that a deep-sea cable weighs about one ton per nautical mile. Cables cost from $350 in deep sea to $1500 at the shore end per mile. The cost of maintenance is often heavy and requires the services of specially equipped vessels.

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TELEGRAPHY, Wireless. See Wireless Telegraphy.

TEL EL AMARNA. See Tell el Amarna.

TEL EL KEBIR. See Tell el Kebir.

TELEMACHUS, tē-lĕm′ȧ-kŭs (Lat., from Gk. *Τηλέμαχος*). In Greek legend, the son of Ulysses (q.v.) and Penelope (q.v.). At the opening of the *Odyssey* he is represented as led by Athena, who had appeared to him in the guise of Mentor, a trusted Ithacan friend of Ulysses, in search of tidings of his long-absent father, since he was unable alone to expel the insolent suitors of his mother. Having visited Pylos and Sparta, Telemachus returned to Ithaca, where he found his father in the guise of a beggar, at the hut of the faithful swineherd Eumæus. After Ulysses had revealed his identity to his son, they carried out a plan for the slaying of the suitors. In post-Homeric legend, after the death of Odysseus Telemachus and his mother accompanied Telegonus (q.v.) to the island of Circe (q.v.), where Telegonus wedded Penelope, and Telemachus Circe.

TELEMACHUS. A Syrian monk who in 404 a.d. leaped into the arena of the Coliseum during a gladiatorial combat, attempting to separate the contestants. He was stoned to death, but his heroic protest led Honorius to suppress gladiatorial fights; at least there is no evidence of their taking place after this time.

TÉLÉMAQUE, tā′lā′mȧk′, Aventures de (Fr., Adventures of Telemachus). A romance, with some political significance, by Fénelon (1699), founded on the adventures of the son of Odysseus and largely influenced by Barclay's *Argenis* (q.v.).

TELEM′ETER (from Gk. *τῆλε*, *tēle*, afar + *μέτρον*, *metron*, measure). An instrument for measuring the distance to a remote object, used in surveying and in military operations by engineers and artillerists. There are many forms of telemeter, which consist for the most part of telescopes and mirrors by means of which angles can be read and the distance computed. The telemeter of the United States Coast and Geodetic Survey is more generally known among American engineers as the stadia (q.v.), and in Great Britain as a tachometer. It consists of a mounted telescope with two extra horizontal cross wires or stadia hairs that intercept a certain number of divisions on the image of the graduated rod held upright at the distant point. The distance of the rod from the instrument is obtained by multiplying the reading by a constant factor which depends upon the construction of the telescope. Stadia measurements are particularly useful in making a rapid survey or reconnaissance and are accurate to about one part in 700. Consult I. O. Baker, *Engineer's Surveying Instruments* (2d ed., New York, 1892). See Range Finder; Surveying.

TEL′EOL′OGY (from Gk. *τέλος*, *telos*, end, completion + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). A term used in philosophy to denote any theory which explains the world as in some way controlled by intelligent purpose. The question teleology answers in the affirmative is whether in the universe as a whole, or even in the phenomena of terrestrial organic life, there is some actually purposed end controlling the course of events. It is certain that the tendency to interpret actions teleologically appears in very early childhood. Primitive animism (q.v.) seems to rest on a deep-seated instinct, and a mechanistic (see Mechanism) conception even in limited application was achieved with great difficulty. The prevailing trend of Greek thought was teleological and it culminated in the systems of Plato and Aristotle. The more mechanistic views which resulted in the materialism of Leucippus and Democritus did not meet with general acceptance. It was reserved for modern science to develop a thoroughgoing, systematically and experimentally grounded mechanism. Probably the greatest blow to teleology was the appearance of Darwin's *Origin of Species*.

At present teleology is maintained mainly in idealistic circles in philosophy. For instance, James Ward, Josiah Royce, Bernard Bosanquet, and Hugo Münsterberg are all teleologists. They do not deny the partial value of the mechanistic hypothesis, but they subordinate mechanism to teleology. For them mechanism is a descriptive device, but as reality is at heart spiritual in nature, teleology is the more adequate point of view.

Bergson has attempted to develop a view according to which neither mechanism nor teleology has ultimate validity. For him teleology is only an inverted mechanism, belying the spontaneity and unforeseeableness of vital development, and yet nearer the truth than the mechanism of efficient causation. "The future appears as expanding the present: it was not therefore contained in the present in the form of a represented end. And yet, once realized, it will explain the present as much as the present explains it, and even more; it must be viewed as an end as much as, and more than, a result." Consult: Paul Janet, *Final Causes*, Eng. trans. from 2d Fr. ed. by William Affleck (New York, 1883); Franz Erhardt, *Mechanismus und Teleologie* (Leipzig, 1890); Max Adler, "Kausalität und Teleologie im Streite und die Wissenschaft," in *Marx Studien*, vol. i (Vienna, 1904); Bernard Bosanquet, "Meaning of Teleology," in *Proceedings of the British Academy* (London, 1905–06). See also Materialism; Mechanism, and references there given.

TEL′EOSAU′RUS (Neo-Lat., from Gk. *τέλεος*, *teleos*, *τέλειος*, *teleios*, complete + *σαῦρος*, *sauros*, lizard). An extinct crocodile, fossil skeletons of which are found in the Jurassic rocks of Europe. The animal was small and had a much elongated tubelike snout armed with numerous small outward-curving teeth. The body was covered by tuberculated scutes. See Crocodile.

TELEP′ATHY (from Gk. *τῆλε*, *tēle*, afar + *-πάθεια*, *-patheia*, from *πάθος*, *pathos*, feeling). A term coined by members of the Society for Psychical Research: "We venture to introduce the words Telæsthesia and Telepathy to cover all cases of impression received at a distance without the normal operation of the recognized sense organs." (See Psychical Research, Societies for.) E. Gurney, F. Myers, and F. Podmore in *Phantasms of the Living* (1886) say that "under particular conditions of excitement—the rationale of which we probably do not understand, though insensibility and the near approach of death are apparently some of the most effectual of these conditions—certain persons seem to have the faculty of communicating to other persons at a distance what is happening to them, often without any intention or consciousness of doing so on their own parts," and further, that "certain small experimental results can be produced," and that "certain impressive spontaneous phenomena are shown to belong to the same class." Hyslop uses the term to cover "coincidences between two living persons' thoughts which are not due to chance coincidence or to normal sense perception." He thus defines it negatively as a "name for the facts that baffle normal explanations, and indicate our ignorance, not our knowledge." Most of the investigators in the field, while admitting a bias, profess their willingness to rest their case upon the experimental findings. Every attempt is made to control the conditions; and cases which are not properly attested, or which can be explained by muscle reading, hypersensitivity, etc., are eliminated.

The actual evidence upon which the belief in telepathy now rests may be classified as (1) experimental, the communication from agent to percipient of simple visual impressions—diagrams, and color, suit, and number of playing cards, etc.; (2) certain striking cases of the induction of sleep at a distance, notably that of Madame B., or Léonie, reported by J. Ochorowicz; (3) statistics of what are known as veridical hallucinations, i.e., apparitions of a person to some distant friend at the time of the person's death; (4) the performances of certain test mediums, especially of one, Mrs. Piper, whose case has been investigated at length by the Society for Psychical Research; and (5) results of cross correspondences, i.e., cases in which two mediums at a distance from each other simultaneously produce automatic script which is meaningless until the two specimens are put together. All this evidence itself rests upon the assertion that the number of coincidences exceeds the number attributable to chance according to the law of probability; e.g., veridical hallucinations are said to be 440 times more numerous than they should be according to chance alone. The verdict of science is still, however, "not proven."

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TEL′EPHONE (from Gk. *τῆλε*, *tēle*, afar + *φωνή*, *phōnē*, sound). An instrument for the transmission and reproduction of articulate speech between two or more distant points. The idea of transmitting sound to a distance found its first practical expression in the speaking tube and later in the string telephone. The latter comprises two hollow cylinders, one end of each being covered by a taut membrane and connected with the other by a stretched string. The vibrations of the diaphragm of one cylinder caused by the sound waves striking it are transmitted through the string to the other membrane. Hooke referred to such a combination when in 1667 he stated that by the help of a tightly drawn wire, sound could be propagated to a considerable distance, even through stone walls and surrounding buildings. Sir Charles Wheatstone described in the *Repository of Arts*, September, 1821, an instrument for transmitting sounds, which he called the telephone. This device consisted of a number of solid rods connecting musical instruments with sounding boards, which were placed at a distance from the instruments, and it is stated that the sound was successfully reproduced.

The present article, however, deals with the electrical reproduction of articulate speech. The discovery of Oersted in 1819, showing the relation between electricity and magnetism, that of Sturgeon of 1824 showing how a magnet was produced when current circulated around a coil of wire surrounding an iron core, and that of Sir Michael Faraday showing that electricity was induced in a conductor when moved in a magnetic field, are all of extreme importance to the development of the electrical telephone. The germ of the telephone may be dated back as far as 1837, when Page of Boston found that a bar or needle of iron would give out sound when subjected to rapid cycles of magnetization and demagnetization.

Charles Bourseul in *L'Illustration*, Paris, 1854, prophesied the transmission of speech: "I have asked myself, for example, if the spoken word itself could not be transmitted by electricity; in a word, if what was spoken in Vienna may not be heard in Paris? It is practically this way: suppose that a man speaks near a movable disk, sufficiently pliable to lose none of the vibrations of the voice, that this disk alternately makes and breaks the connection from a battery; you may have at a distance another disk which will simultaneously execute the same vibrations."

The first electrical apparatus described as a telephone by its inventor was devised by Philipp Reis (q.v.) of Germany in 1861. This embodied the suggestions of Bourseul and the Page effect. The elements of the Reis telephone are shown in Fig. 1. The flexible disk of membrane *D* mounted over the opening of a box carried a small piece of platinum *P* at its centre; near this is the spring *S* with which the platinum alternately made and broke contact when the membrane was caused to vibrate by the sound waves. These contacts form the terminals of a circuit containing a battery *B* and the receiver *R*. The making and breaking of the circuit between *P* and *S* caused intermittent currents to flow through the coil of the receiver, these producing molecular vibrations in the needle giving out sound as noted by Page. This sound was considerably amplified by the sounding box on which the needle was mounted. By such means the pitch of any sound may be reproduced at a distance, but this is only one characteristic, for, besides it, sound has quality or timbre, which makes it distinctive, and degrees of loudness or intensity. To transmit articulate speech these three elements must be reproduced, and this cannot be done by any apparatus which functions through current interruptions. Hence the Reis telephone failed to reproduce any but

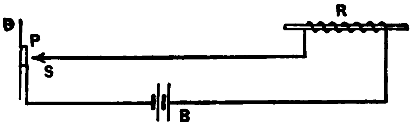


FIG. 1. ELEMENTS OF REIS TELEPHONE.

pure musical notes and then only as regards pitch.

Invention of Bell. No apparent advance was made in working out the problem of the articulating telephone for about 16 years after Reis's work, but on Feb. 14, 1876, Prof. Alexander Graham Bell of Boston applied for United States patent rights on new and useful improvements in telegraphy in which a method for transmitting vocal sounds was described and claimed. United States patent number 174465 covering this method was granted March 7, 1876. Prof. Elisha Gray applied for a patent on the same day for a similar instrumentality. Extensive and long-drawn litigation over the question of priority resulted, but Bell's claims were ultimately sustained by the Supreme Court. The principle of the Bell instrument is shown in Fig. 2, and when using this the speaker talks at a thin sheet-iron diaphragm which vibrates in synchronism with the sound waves impinging upon it. This vibration is transmitted electrically to a similar device at the distant station. The diaphragm *D* is placed behind a conical mouthpiece which the speaker holds close to his mouth and the listener close to his ear. A magnet *M* is placed back of the diaphragm and upon its forward pole piece, which is very close to, but not in contact with, the disk, is located a coil *C* of many turns of very fine insulated wire. The ends of the coils are connected to the transmitting wires as shown in Fig. 2. One instrument serves as the transmitter and the second as a receiver, though their functions are reversible. No battery is needed, for the transmitting instrument generates the actuating currents as follows: the magnet *M* causes a certain number of magnetic lines to pass through coil *C;* many find their way into the iron diaphragm and when this vibrates it produces a change in the number of magnetic lines passing through the coil *C,* increasing as *D* approaches the pole tip and diminishing as it recedes. This variation of magnetic lines induces a voltage and current in coil *C* in accordance with Faraday's discovery of electromagnetic induction in 1832. As the current flows through the coil at the receiving instrument, it either momentarily strengthens or weakens the magnet. This change causes the diaphragm of the receiver to vibrate in synchronism with the actuating disk and thus the sound is reproduced. The receiver of to-day is in principle the same as the original Bell receiver with detail mechanical improvements. For instance, a compound magnet may replace the single bar, or a bipolar magnet with coils on each of its pole tips as in Fig. 3 may be used. This latter form is more sensitive and responds to currents of less than one millionth of an ampere.

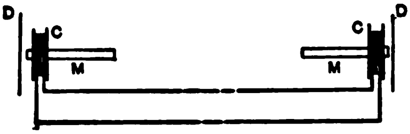


FIG. 2. ELEMENTS OF BELL TELEPHONE.

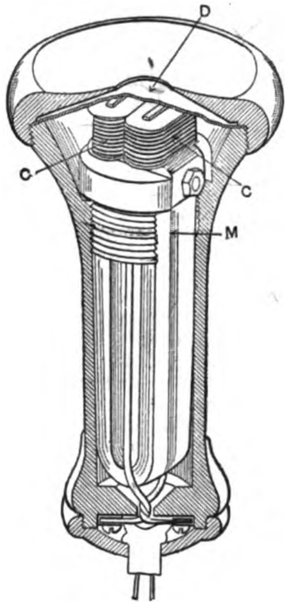


FIG. 3. BELL RECEIVER.

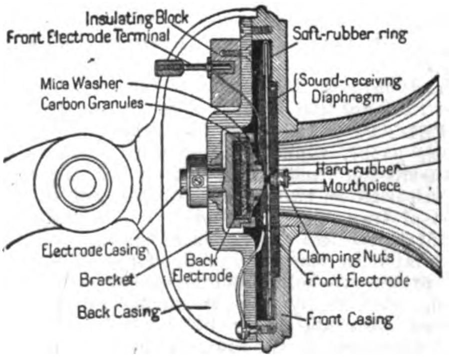


FIG. 4. WHITE SOLID-BACK TRANSMITTER.

Transmitters. The Bell transmitter, while perfectly satisfactory for short lines, was not powerful enough to satisfy the requirements of longer lines and it was consequently replaced by another form, now known as the carbon transmitter. In this device a change in contact resistance between carbon elements is produced by the sound waves, altering the pressure between the contact surfaces; and this sets up current pulsations in synchronism with the sound waves. Previous to this, however, both Bell and Gray invented electrolytic transmitters of almost the same character. These comprised needles mounted at the centre of vibrating diaphragms dipping into a liquid of rather low conductivity. The current passed through the needle and the liquid, and the resistance of the circuit varied with the depth of immersion of the needle into the liquid as influenced by the vibrations of the diaphragm. The next transmitter was that of Berliner, 1877, based on the variation of resistance with pressure. A diaphragm vibrated in contact with a metal knob, and Edison at about the same time devised a transmitter wherein a button of compressed carbon was in contact with a small disk of platinum on the diaphragm. The microphone of Hughes, 1878, wherein two bodies are in loose contact, has furnished the type of modern transmitters and in these the carbon is in the form of finely divided granules held between two conducting plates, one of which is the diaphragm on which the sound waves strike. The transmitter in most general use at present is the White or solid-back transmitter, Fig. 4. In this the carbon granules are placed between two carbon disks, one being in contact with the solid back of the instrument, while the other is carried by the diaphragm with which it vibrates. The rear disk forms one electrode while the front one, insulated from the rest of the apparatus excepting through the carbon granules, is connected to the opposite pole of the circuit.

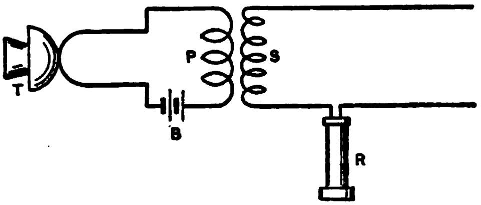


Fig. 5. INDUCTION COIL IN TRANSMITTER CIRCUIT.

The variation in the resistance of a transmitter should produce a marked degree of variation in the current, and to accomplish this it is necessary that the resistance of the circuit containing the transmitter shall be small; to this end Edison introduced an induction coil into the transmitter circuit. As employed the induction coil comprises a primary winding of a few layers of moderately heavy copper wire, a concentrically wound coil or secondary of a larger number of turns of finer wire, and a core of soft iron wire. The primary coil *P* is placed in series with the transmitter *T* and the battery *B;* the secondary coil is connected to the transmitting line as shown in Fig. 5. Any difference of intensity in current caused by a change of resistance in the transmitter circuit will induce currents in the secondary which will alter the magnetism of the distant receiver and the original vibrations of the sound waves will be reproduced. The addition of the induction coil makes the apparatus more effective and the increase in voltage caused by the many turns of the secondary enables the message to be transmitted a much greater distance.

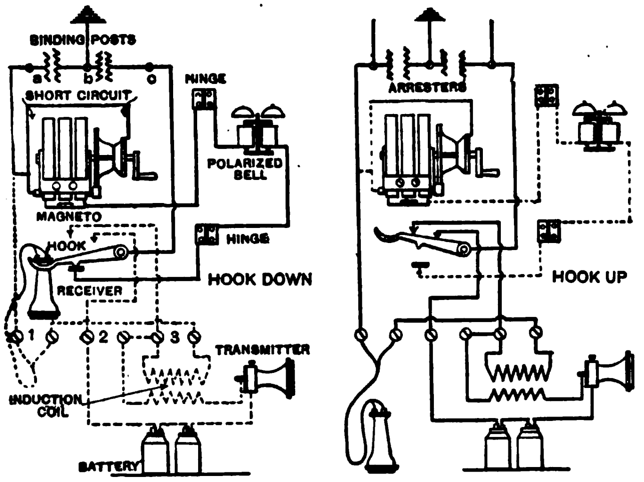


Fig. 6. SUBSCRIBER'S EQUIPMENT. LOCAL BATTERY SYSTEM.

The telephone was at first intended for private use, but very early in the history of its development, 1877, G. G. Hubbard (q.v.) recognized that its scope could be greatly extended by the establishment of telephone exchanges, to which the instruments of subscribers could be connected and at which any one subscriber could be connected to another by appropriate switching arrangements. Thus a complete telephone equipment must be provided with signaling devices so that the operator at a central station can call the subscriber or the converse. In the case of a local battery equipment, the subscriber's outfit is provided with a magneto and bell. The magneto is a small electric generator in which the armature is revolved by a few vigorous turns of a crank and a current of 75–100 volts transmitted over the lines to the exchange, at which point a drop or buzzer is actuated. The apparatus of a subscriber's equipment on a local battery system is sometimes arranged as shown in Fig. 6. When the receiver is on the hook, the line connections are such that the bell and magneto are in circuit. The magneto on account of its high resistance is automatically short circuited when not in use. The subscriber when signaling central leaves the receiver on the hook and turns the crank of the magneto. When he is ready to talk the receiver is taken off the hook, the signaling circuit is cut out, and the talking circuit, including the transmitter and receiver, is introduced. In the figure the dotted lines show the portions cut out by the hook in its various positions.

In the ordinary or multiple switchboard when a party calls his signal is shown at a drop near what is termed the answering jack in the exchange and when a party is called the connection is made to what is termed the ringing or multiple jack. Only one answering jack exists per subscriber, but each subscriber has a large series of multiple jacks, the number depending upon the size of the exchange. In the case of the multiple type of board, the subscribers' answering jacks are arranged over various panels, but only one for each subscriber, and at these are placed the corresponding indicator drops or lamp signals actuated when the subscriber calls. The multiple jacks, however, are usually so arranged that every operator has one for every subscriber within arm's length. For instance, if say 3000 subscribers are connected to an exchange, about 300 answer jacks are arranged per panel, or 10 operators' panels would be needed with two extra end panels. Above the answer jacks are the multiple or calling jacks, 1000 for each panel. Three panels comprising a section would have the entire number of subscribers placed upon them. At the extreme right of the board there would be a panel without answer jacks and similarly at the extreme left. The multiple jacks on the left hand panel would number 2001 to 3000, on the second panel they would number 1 to 1000, and on the third panel they would number 1001 to 2000. Hence the operator sitting at the second panel would have within her reach multiple jacks of every subscriber. Each section is comprised of three panels. The connection between subscribers during a conversation is made by means of a cord circuit as illustrated in Fig. 7. When a call is received the current coming in on the line wire causes the drop to fall, thus announcing the number of the calling subscriber; central operator then inserts the answering plug into the corresponding jack and presses the listening key, thus placing her instrument into circuit. She then inserts the ringing or calling plug of the cord circuit into the nearest calling jack belonging to the line of the desired or called subscriber and by pressing the ringing key sends a signal to the latter's instrument. When the conversation between the connected parties on the magneto or local battery system is completed, the subscribers ring off by placing their receivers back on the hooks and turning the magneto cranks; this sends a current through the clearing-out drop connected across the cord circuit, which buzzes and indicates to central that the conversation is completed.

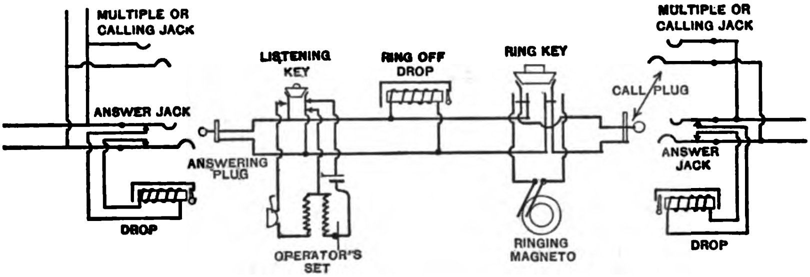


FIG. 7. CIRCUIT ON OPERATOR'S BOARD. LOCAL BATTERY SYSTEM.

Common Battery Systems. The use of a common battery at a central station has been an important development in the telephone exchange, as it does away with the magneto call at the subscriber's instrument, which is the most expensive part of the equipment, and assures reliability of signals, as that is accomplished automatically when the receiver is removed from the hook. Further there is a saving in using one large battery centrally located in place of separate sets at the various subscribers' instruments. Placing the talking battery at a distance from the transmitter tends to introduce difficulties in the clearness of speech transmission. Various systems have been devised by Stone, Hayes, Kellogg, Dean, Carty, and others which largely eliminate the trouble. Hayes's arrangement (Fig. 8) illustrates the fundamental principles of the central energy or common battery system employed by the Bell companies. To signal the central station the subscriber simply removes his receiver from the hook, thus closing a circuit which acts upon a relay and causes an incandescent lamp to glow. The circuit, starting from *a*, continues along wire *c*, through lamp relay, to line *L′L*, to ground. This gives the signal to the central operator, who immediately makes the talking connection by inserting the answer plug into the answer jack and pressing her listening key; then having obtained the number of the desired subscriber, the operator tests the sleeve of the nearest multiple jack of the called party with the tip of the calling plug, and if no click is heard (showing the battery is not connected to the socket of the jack, i.e., line not busy) she pushes the plug all the way into the jack and presses the ringing key, exactly as in the case of the multiple board in the local battery system. The diagram, Fig. 8, shows the circuit when the line is not arranged for talking. The sides of the line are represented by *L* and *L′*, the central office battery, usually a storage battery of 24 volts, by B_1. *P* and *S* are the primary and secondary windings of the subscribers' induction coil. Between the points *x* and *g* at each subscriber, a bell *B* and a condenser *C* are permanently bridged. At the point *e* a tap runs to one side of the receiver *R* through the induction coil winding *P* to the *L′* side of the line through *S*. The hook switch makes contact at *l*. The transmitter *T* is inserted between the hook switch *H* and the point *g*. The connections at both ends of the line are identical. Assume the transmitter *T* to be at rest, the answer plug to be in and the hook up; it has a certain resistance, and owing to the battery voltage, a current will flow from the positive side in the direction of the arrow, along the *L* side of the line, through the transmitter *T* to the hook switch, thence to the negative side of the battery. Between the points *e* and *g* there will be a certain

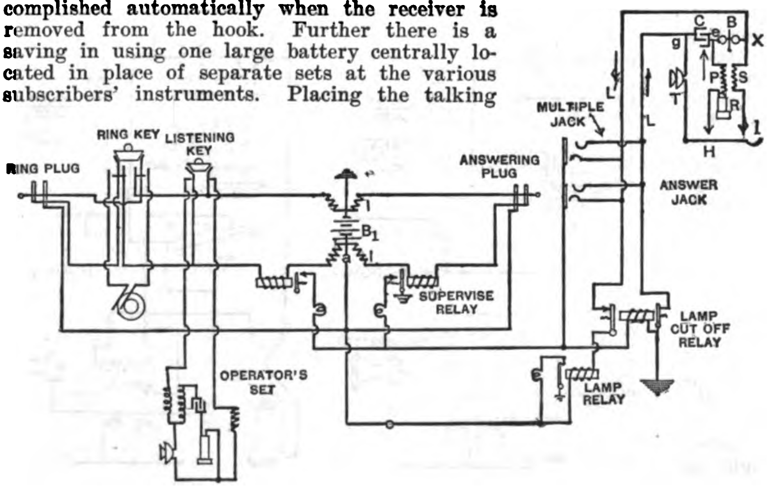


FIG. 8. CIRCUIT ON OPERATOR'S BOARD. CENTRAL ENERGY SYSTEM.
(Hayes's arrangement.)

difference of potential and the condenser C will be charged to the same pressure. Suppose the transmitter be spoken to and its resistance suddenly decreased, not only will a greater current flow through the path just described, but in addition a portion of the charge in the condenser will pass from the positive side in the direction of the arrow, through the winding P of the induction coil, and thence to the negative side of the condenser, the same direction as before. This current, traversing the winding P in the direction of the arrow, will induce a current in the winding S. The condenser thus increases the line current, which in turn increases the effect in the receiver at the other end of the line. The coils I, at the exchange, which may be either impedance coils or special induction coils (called repeating coils), prevent the talking current from being shunted through the battery.

In the case of a 10,000 subscriber switchboard the storage battery must be capable of giving an average current of 500 amperes, and to insure proper working condition it must give a discharge of not less than 2000 amperes. For charging such a battery as this, suitable generators must be employed, and these must deliver a charging current to the battery of at least 1000 amperes. The introduction of such currents as these has resulted in power plants at central offices, upon which the operation of the telephone switchboard and apparatus is wholly dependent. All of the various systems for central energy in actual practice are necessarily exceedingly complex and are subject to important modifications and improvements.

In most large cities the greater number of telephone calls originating in one exchange are for subscribers connected to some other exchange. For instance, in cities like New York and London, probably 80 per cent of the telephone calls are trunked from one exchange to another. The procedure in such a case is substantially as follows: Various trunk lines run from one exchange to another and these are in charge of trunk-line operators. When a local operator receives a message for an exchange other than her own, the trunk operator is called up, connections made between the answer plug and the trunk operator's line, who in turn connects to the central designated. The trunk operator at the second central connects the selected trunk line and notifies the local operator at that exchange to connect in with the party called. In the case of an ordinary multiple board the multiplication of the ringing jacks or multiple jacks varies substantially as the square of the subscribers connected. For instance, in an exchange of 3000 subscribers, with 300 per panel, there would be 30,000 multiple jacks; with an exchange of 9000 subscribers arranged in the same manner, there would be 270,000 multiple jacks or nine times as many as in the first case. Thus the multiple board soon reaches its limit and it is estimated that 10,000 is the maximum number of subscribers that can be satisfactorily connected to such type of board.

In view of the fact that such a large percentage of calls originate in one exchange and terminate in some other exchange, the later types of board have been modified to resemble in their action the trunking arrangement. This form of board is known as the transfer, express, or A and B type; and in this there are no multiple jacks, simply the answer jacks, the signaling device, and transfer lines. In most of them the annunciators, or more usually lamps, and the answering jacks are combined at a special board designated the call or B board, while the answering and the giving of instructions for connections are done at the order or A board. Transfer lines are run between the two boards fitted with signaling apparatus to insure prompt attention. In operating, the call is received at B board and at once transferred by the B operator without answering through a transfer line to the order (A) board, a lamp lighting to show the call. The A operator ascertains the number required and instructs by order wire a B operator at the proper B board to connect the required number. This second B operator selects the proper transfer line to be used and notifies the A operator who in turn again advises the first B operator what connecting lines or transfer lines have been selected for the call originating at her board. In this arrangement, therefore, three operators instead of one handle the call. This requires somewhat longer time, but since in practice records show that the time of answering a call on the part of an exchange is from three to five seconds, the delay incurred is not excessive.

Lines. The connections between subscribers and exchanges in most telephone circuits, and particularly in all telephone circuits outside of rural communities, are entirely metallic and of copper. The disturbances introduced by grounded circuits are such that clear conversation is most difficult. When a single telephone wire swings in the earth's field, voltage is induced therein which will cause a flow of current, varying in direction as the wire swings back and forth, introducing false tones. Also when any difference of potential exists between terminals of the grounded line, earth currents flow through the telephone wire, again interfering with the signal or conversation by producing buzzing and humming in the line. When double circuits, i.e., entirely metallic ones, are used, there is also trouble, common as well to grounded circuits, which is technically defined as induction disturbance. When telephone wires run close to power transmission lines, the varying magnetic field around the power wires interlinks with the former and induces in them a voltage of the same frequency as the power current. Passing storm clouds charged with electricity will also produce current flow in the telephone conductors by static influence. These phenomena also cause buzzing and humming in the instruments. Similarly there is electromagnetic induction between neighboring telephone wires which results in the production of what is known as cross talk. To prevent such noises and cross talk, the wires of a telephone line are usually transposed every quarter of a mile. Fig. 9 shows a common transposition scheme. The vertical lines represent the cross arms of the poles where the transpositions are made. In all cases two adjacent telephone circuits must not be transposed at the same points, the transposition points being

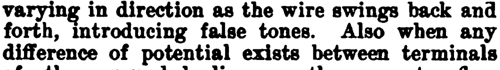


FIG. 9. TRANSPOSITION OF LINE.

staggered or alternated with respect to each other; on very busy lines the transportation is carried on so frequently that the circuits become twisted wires with about 10 twists per mile.

Long-Distance Telephony. This was first made possible in 1885 when the American Bell Telephone Company organized the American Telephone and Telegraph Company. For several years previously experimental lines with metallic circuits of hard-drawn copper were operated between New York and Boston. In 1885 a regular line between New York and Philadelphia was constructed and so great was its success that within two years lines were established between New York and Boston, Albany and Rochester, Chicago and Milwaukee, Boston and Providence, and New York and New Haven. The New York and Chicago circuit, 950 miles distant and having 1900 miles of wire, was opened in 1902, and the circuit connecting New York and San Francisco, with about 6800 miles of wire, was opened Jan. 25, 1915.

In long-distance circuits various added difficulties were encountered, known as attenuation and distortion. Attenuation is a simple falling away of the amplitude of the vibration due to the ohmic resistance loss in the conductor. This in itself is not harmful if not carried too far and it may be avoided to some extent by the use of large conductors. Distortion is due to the fact that waves of different periods or rates of vibration are unequally affected. As already pointed out, speech waves are made up of the combination of waves of various frequencies (pitch) and of various shapes (timbre). If the relative proportions or positions of the waves are altered in telephonic transmission, distortion results and the special quality of the sound is lost. In fact the words may become indistinguishable even though the volume of the sound is large. In about 1885 Oliver Heavyside showed mathematically that by adding inductance to a line having an excessive capacity, as most long telephone lines have, and particularly so if they are underground, the distortion of the telephonic waves might be prevented and the speaking improved.

Pupin Loading Coils. Various attempts to introduce this inductance properly have been made, but the practical application of inductance appears to have been neglected until 1900, when Dr. M. I. Pupin of New York took out patents for improving the speaking on long telephone lines. The essential part of his discovery was the determination of the amount of correcting inductance to be added and the points at which this inductance should be joined in series to the line. The mitigation of the distortion trouble in accordance with the Pupin method is to-day termed loading the line. It has been a common mistake to suppose that this method depends upon the so-called neutralizing or balancing of capacity by inductance reaction. As a matter of fact the condition of resonance obtained when the inductance multiplied by the capacity is equal to $\frac{1}{(2\pi f)^2}$, is not at all desirable in telephony as it would tend to exaggerate one particular frequency and damp out the others, this being fatal to telephonic transmission of speech. The Pupin invention depends upon entirely different physical principles; in fact the higher the inductances within reasonable limits the better the results, which proves that the method does not depend upon obtaining a certain value or balance of the inductance reactance and the capacity reactance.

This inductance could be theoretically uniformly distributed, as was attempted by Heavyside, but it becomes practically impossible to do so, or it may be applied at points, provided these points are not too far apart. In other words, there should be several coils per wave length. This is the essential feature of the Pupin invention. Considering the Pupin invention from the purely electrical standpoint, we have only three possible reactions in any electrical circuit: First, resistance reaction; second, inductance reaction; and third, capacity reaction. The resistance reaction is absolutely destructive of energy and causes the attenuation. The inductance and capacity reactions on the other hand do not represent a dissipation of energy excepting so far as resistance is unavoidably present. These reactions, themselves, if free from resistance would represent only the storage of energy without loss. It is evident, therefore, that the loss of energy and the attenuation of the wave are increased by increase of resistance. Inductance, on the other hand, represents no essential loss of energy and the total amount applied to one end of the line would be given out at the other, so far as this reaction is concerned. It is also a fact that it is essential to have stored energy present in order that a wave may be transmitted at all. The energy of the wave is self-contained and each wave or portion of a wave must be carried along by the energy originally applied to form it, since it receives no fresh impulse after once leaving the source of the electromotive force. The energy represented by inductance is equal to $\frac{1}{2}Li^2$; with a large value of L, it is not necessary to have a considerable value of current. This is a great gain, since the loss of energy is entirely due to the resistance and is proportional to i^2. This is the very secret of the Pupin invention, which enables us to have a considerable amount of energy present by increasing the inductance to a higher value, but keeps the current upon which the loss of energy depends at a small value. The question naturally arises, why not increase the capacity reactance, which also represents a storage of energy and not a loss of it? The answer is that a large capacity gives a small capacity reactance and therefore a large current, and hence increasing the capacity increases also the current and the loss of energy, which is proportionate to the square of that current.

The loading coils, as the added inductances are called, are merely turns of insulated wire wound on very finely laminated iron cores incased in water-tight boxes, which may be mounted on poles if used with aërial lines or if used in cable lines may be placed in manholes. In long overhead lines a coil is generally inserted in series at intervals of 2½ miles; on underground lines at intervals of every 1000 feet. These coils have a resistance of 2.4 ohms and an inductance of about 0.25 henry. The same efficiency of speech transmission can be obtained by loaded lines of the same length as nonloaded ones and with one quarter the weight of copper.

Another factor which has made possible telephonic transmission of speech over very great distances and which compensates for attenuation is the repeater. The function of a repeater as in telegraphy is to break up continuous circuit lengths, thus reduce the capacity of the line, and at the same time actuate the second section by the impulses impressed upon the first section. These relays must be capable of operating in both directions. Electromagnetic and mechanical repeaters have been attempted in telephony, but they have not proved at all satisfactory. The vacuum repeater similar to that used in wireless telegraphy and telephony has been employed with success on the New York-San Francisco line. The form of vacuum repeater which is most widely known is that of the so-called audion type, developed originally by Lee De Forest in 1902. It consists of an evacuated bulb containing a hot cathode, usually a lamp filament heated by the passage of current, an anode in the form of a plate, and a third electrode in the form of a grid or mesh interposed between the cathode *F* and the anode *A*. Fig. 10 illustrates the method of using such a tube for amplifying weak electrical impulses. The operation of the device is as follows: Current from battery *B* heats the filament *F*, which thereupon emits negative ions or electrons. The battery *B* maintains the anode at a potential of 25 volts or more with respect to the filament, so that electrons emitted by the filament pass across the tube to the anode, creating a steady flow of current through the telephone *T*. The value of this current is dependent, among other things, upon the potential of the grid with respect to the filament and it may be varied within wide limits by changing the grid potential. Fig. 11 illustrates this characteristic of the tube. It is evident that a negative charge imparted to the grid reduces the plate current while a positive charge increases it. The action of the system indicated by Fig. 10 when an alternating voltage curve *A* is impressed upon the grid is shown diagrammatically by the curves of Fig. 12; curve *B* shows the pulsating current through the telephone *T*. As the energy required on the input side to operate the repeater is only that which is needed to charge the grid, the ratio of energy output to energy input is extremely large. An amplification of energy of the order of 1000 to 1 is readily obtained. When greater amplification is needed, two or more tubes may be connected in cascade. The use of repeaters of this type on telephone lines is attended with considerable complication and if the amplification is carried too high the line will howl, i.e., the application of too large an amount of energy to the line which is being repeated into will react upon the actuating line and create noises therein, the condition being one of an unstable balance. The principle of the repeater connection for telephonic lines is illustrated in Fig. 13, in which a single tube is shown in a two-way system.

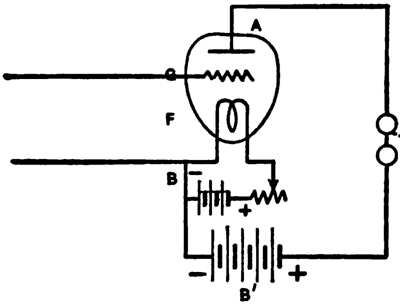


FIG. 10. VACUUM REPEATER. AUDION TYPE.

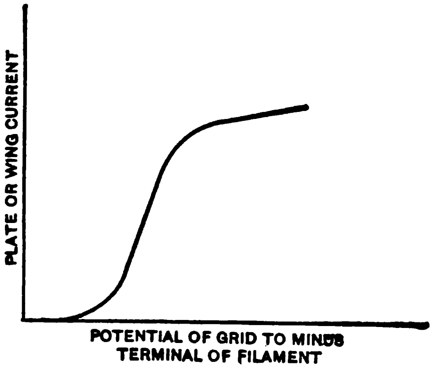


FIG. 11. CURRENT CURVE IN AUDION REPEATER.

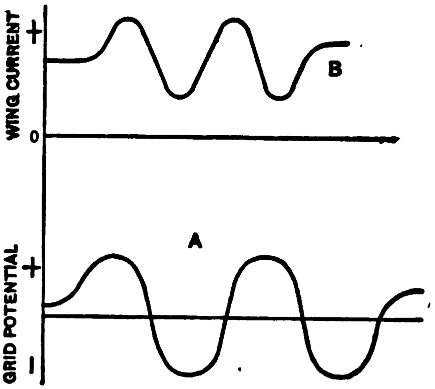


FIG. 12. VARIATION IN CURRENT DUE TO CHANGE IN GRID POTENTIAL. AUDION REPEATER.

Party Lines. One of the best advance agents of the telephone companies is the party line, whereby two or four subscribers are connected to the same circuit, receiving their service at a reduced rate on account of the economy in line conductors. In order to advise which one of the subscribers is wanted when a signal is to be sent from the exchange, different methods of calling have been devised and these have been termed selective and nonselective. On nonselective lines a signal for any party operates the

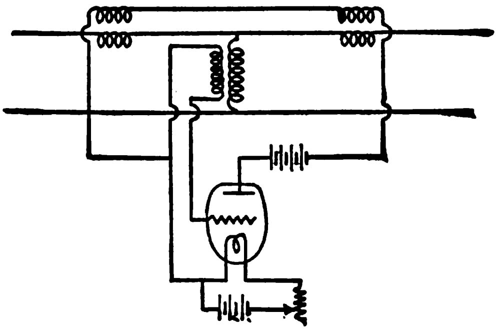


FIG. 13. REPEATER CONNECTIONS IN TWO-WAY SYSTEM.

ringers at all stations, each subscriber having a particular signal or group of periods of bell ringing, which signal he only is meant to answer. This is quite objectionable; for even though one party is called, others on the line hearing the signal may listen in. To avoid this difficulty, selective signals have been devised and in these each station is equipped with a ringer which will respond to its own call, the others remaining silent. Three different principles for party-line selective calls have been devised. These are known as the harmonic, the biased-bell, and the step-by-step arrangements. In the case of the harmonic selective system, each ringer has a spring-supported armature which will respond to but one frequency of current and no other. In the biased-ringer system polarized bells are used with springs connected to their armatures so that they will respond only to currents flowing in certain directions and these are arranged for four-party calls as shown in Fig. 14. The bells are normally disconnected from the lines, and are only connected when they are to be rung, and then by means of relays inserted in the branches in series with condensers. These relays are operated by alternating currents sent through the circuit by closing the desired ringing key. This connects the bells to the line and when this occurs the desired pulsating current is superimposed upon the proper line side to ring the bell of the selected subscriber through relay contact and ground. Step-by-step party-line systems select the desired subscriber by the operation, one after another, of a set of switches at the subscriber's station by current impulses sent out from the central office.

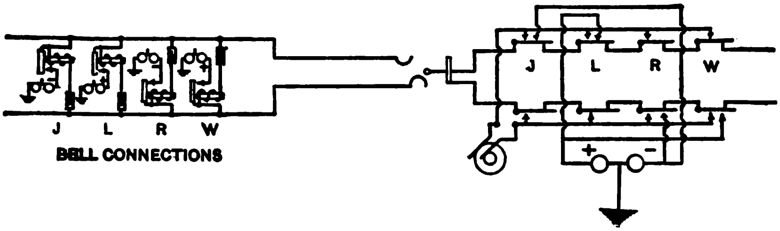


FIG. 14. PARTY-LINE RINGER. BIASED-BELL SYSTEM.

Automatic Telephone Systems. In automatic telephony the subscribers are enabled to secure intercommunication without the assistance of an exchange operator. Strowger, an electrical engineer and mechanician of Chicago, in 1891, introduced the first automatic telephone system, and shortly afterward several small exchanges were installed. The earliest of his devices were necessarily crude in design, complex in operation, and imperfect in service, but they served to demonstrate the fact that the fundamental principles involved were correct, and that it was possible to evolve a commercially perfect system. After several years of persistent effort and constant experimenting, a system was provided in which the design was so greatly improved and simplified that the resulting exchange was but little more complicated than the ordinary manual switchboard. Another and more recent advance was to extend the limits of the capacity of the device so that the largest city can be handled as conveniently as that of the smallest village. As in the case of the manually operated switchboard, it is difficult to describe in a lucid and brief manner the mechanism of the operation. The entire system comprises the usual transmitter, receiver, bells, source of energy, and induction coils, but there is also involved a calling dial, at each subscriber's instrument, formed of a metal disk, on the circumference of which are 10 finger holes numbered 1, 2, 3, 4, 5, 6, 7, 8, 9, 0. When a subscriber wishes to make a call he removes the receiver from the hook, when he is connected with the trunk line of the exchange in which are located the connector switches. Assuming, e.g., that the number he wishes is 532, he places his finger in the hole marked 5 and turns the dial around to the stop and then releases it, when it will restore itself, through the action of a spring, to its normal position; similarly, for the following number, he turns the dial to 3 and to 2. This done, he presses a button, when the bell of the subscriber desired is rung and the line closed for conversation. If the telephone of the subscriber called is busy a buzzing sound in the receiver held by the person making the call notifies him of the fact. The automatic switch at the central exchange is a mechanism comprising a pair of relays and three pairs of magnets with their attendant accessories, mounted on a central vertical rod. These are so arranged that when the electrical impulses are sent from the subscriber's telephone who is calling, wiping or contact fingers, corresponding to the number indicated, are brought into connection with complementary brass contacts which are arranged in semicircular banks, thus selecting the number desired. Among the numerous advantages claimed for the automatic system are, (1) that the subscriber himself connects his telephone with that of the person with whom he wishes to converse, and the apparatus is so constructed that it is impossible for another subscriber to cut in or in any way interfere with the line he is using; (2) that the service which the automatic system gives is, unlike that of the manual system, absolutely secret, each subscriber having a private wire on which to transmit his communication—an advantage that cannot be overestimated by the general business man, as well as by the broker, lawyer, and physician.

Phantom Lines. This method of connecting telephone instruments is frequently employed, so that two complete metallic circuits may be made to serve three subscribers in place of two. It is accomplished by bridging the lines with repeating coils and connecting the third equipment between the centre points of the coils,

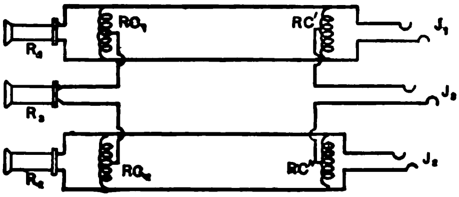


FIG. 15. PHANTOM LINE.

as shown in Fig. 15. The impedance of the coils is so high that it does not short circuit the line across which it is connected, but the current to actuate the middle telephone passes towards the centre of the relay coil and this neutralizes the impedance thereof.

Combined Telephone and Telegraph. Mixed circuits, as these are called, are particularly useful for railway working, as noiseless telephone lines may be obtained from combinations of ordinary telegraph lines. This is accomplished by connecting two lines as shown in Fig. 16. The condensers in the telephone legs shut off the low-frequency telegraphy currents, and the high reactance coils in the telegraphy legs shut out the high-frequency telephone currents. *A* and *B* are terminal telegraph stations and *C* is a way station. The upper line may also serve as a telegraph line, but the instruments are not shown. They would, however, be connected in the same manner as those of the lower line.

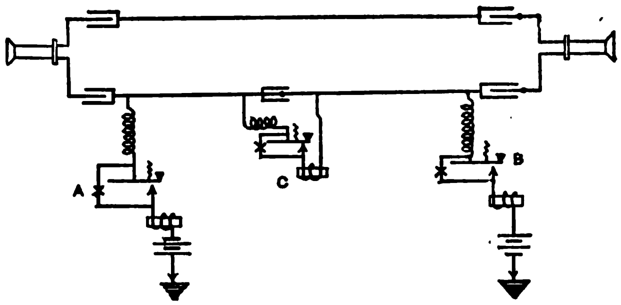


FIG. 16. COMBINED TELEPHONE AND TELEGRAPH.

Statistics. In 1916 the American Bell Telephone Company did the major portion of the telephone business in the United States, though a number of strong independent companies had been organized. The remarkable growth of the telephone industry since its establishment in the United States is shown in table below, abstracted from the United States Census reports of 1912.

CENSUS	Number of systems and lines	Miles of wire	Number of telephones	Estimated number of messages or talks per annum
UNITED STATES				
1912	32,233	20,248,326	....	13,735,658,245
1907	22,971	12,999,369	6,118,578	11,372,605,063
1902	9,136	4,900,451	2,371,044	5,070,554,553
1890	53	240,412	233,678	453,200,000
1880	148	34,305	54,319	....
BELL TELEPHONE SYSTEM				
1912	176	15,133,186	5,087,027	9,133,226,836
1907	175	8,947,266	3,132,063	6,401,044,799
1902	44	3,387,924	1,317,178	3,074,530,060
ALL OTHER SYSTEMS				
1912	32,157	5,115,140	3,642,565	4,602,431,409
1907	22,796	4,052,098	2,986,515	3,999,389,159
1902	9,092	1,512,527	1,053,966	1,996,024,493

The marked increase in the business of the independent companies has largely been due to the expiration of the original patents granted to Bell on his receiver and others relating to transmitters. The independent telephone movement began in 1893, but owing to the monopoly of the art held by the Bell companies, the movement progressed very slowly. Prior to the independent movement the Bell Company had paid very little attention to providing rural localities with telephone service, but in recent years the homes of farmers throughout the country have been connected by well-constructed lines and modern instruments.

Public Ownership of Telephones. In Europe public ownership of telephones exists to a certain extent and there has been agitation in this direction in the United States. For the most part, such public ownership of telephones is national, rather than municipal, and is chiefly confined to countries where private ownership of franchises is far less common than public ownership. Actual statistics are not readily available, and are constantly changing, but an admirable summary of the ownership of telephones in various countries, made by U. N. Bethell, general manager of the New York and New Jersey Telephone Company (see Bibliography below), is as follows:

"All over Europe, with a few exceptions, the industry is controlled and owned by states or municipalities (see table at end of article). In Belgium, France, Switzerland, Germany, Austria, and Hungary the central government operates the industry. In Holland the state operates the trunk lines; in the two principal cities, Amsterdam and Rotterdam, the municipalities operate the local systems; and at The Hague a private company operates. In Denmark and Norway private enterprise under government control operates the industry, while in Sweden the state operates it, except that in Stockholm and vicinity a private company since 1890 has been in active competition with the state. In Great Britain, in most places, private enterprise operates the local systems under license from the state; in a few places municipalities operate or are preparing to operate local systems; the state operates the trunk lines."

Municipal telephone systems were in use or under construction in Great Britain early in 1893 at Glasgow, Portsmouth, Swansea, Brighton, and Hull. The general movement for municipal telephones in Great Britain followed a parliamentary Act of 1899, authorizing municipal construction. Tunbridge Wells and Glasgow, in 1901, were the first to install and operate systems under the Act, but after an active campaign against public ownership in Tunbridge Wells the municipal plant was sold to the National Telephone Company, its private competitor, in the latter part of 1902. It should be added that in 1911 all telephone licenses granted to private companies in Great Britain expired, and in the following year all the lines of the National Telephone Company were taken over by the Post-Office Department, which had had a monopoly of the telegraph business since 1869. See MUNICIPAL OWNERSHIP.

The general question of municipal ownership has been discussed at length under that head. The public interests demand that the business shall be conducted as a monopoly, under public control. Public control does not exist in the

United States to the extent that might be supposed, but that is largely the fault of the legislative and executive departments of the several States, and to some extent of the municipalities also. In many States public-service commissions are empowered to supervise. Finally, the long-distance lines would be a troublesome factor in municipal ownership in America, unless they, as in some countries abroad, were owned by the general government. This has been proposed in some quarters, notably by Postmaster-General Burleson of President Wilson's cabinet.

TABLE OF STATISTICS
(Abstracted from J. E. Kingsbury. See Bibliography)

COUNTRY	Ownership	Instruments connected	Capital invested
Argentina	P	75,000	$16,000,000
Austria	G	173,000	39,400,000
Belgium	G	65,000	14,500,000
Canada	P & G	500,000	74,500,000
France	G	330,000	82,000,000
Germany	G	1,420,000	280,000,000
Great Britain	G	780,500	144,000,000
Holland	P & G	86,500	13,000,000
Hungary		84,000	16,400,000
Italy	P & G	62,000	12,100,000
Japan	G	220,000	24,000,000
Russia	P & G	375,000	51,000,000
United States	P	*9,542,000	*1,150,000,000

P, corporate ownership. G, government control.
* 1914.

Bibliography. H. L. Webb, *Telephone Handbook* (new ed., Chicago, 1901); W. J. Hopkins, *Telephone Lines and Their Properties* (new rev. ed., New York, 1901); A. V. Abbott, *Telephony: A Manual of the Design, Construction, and Operation of Telephone Exchanges* (6 vols., ib., 1903–05); K. B. Miller, *American Telephone Practice* (4th ed., ib., 1905); Houston and Kennelly, *Electric Telephone* (2d ed., ib., 1906); Poole, *The Practical Telephone Handbook* (ib., 1912); McMeen and Miller, *Telephony* (Chicago, 1912); J. C. Slippy, *Telephone Cables* (Pittsburgh, 1913); F. C. Allsop, *Telephones: Their Construction and Fitting* (8th ed., New York, 1914); Radcliffe and Cushing, *Telephone Construction Installation, Wiring, Operation, and Maintenance* (2d ed., ib., 1914); J. E. Kingsbury, *The Telephone and Telephone Exchange* (ib., 1915); J. C. Slippy, *Telephone Appraisal Practice* (Pittsburgh, 1915). For discussion of the public ownership of telephones consult some of the references under MUNICIPAL OWNERSHIP; also papers by Bethell (against), Parsons (for), and Bennett (as to Great Britain) in "Proceedings of National Convention upon Municipal Operation and Public Franchises," in *Municipal Affairs*, vol. vi, No. 4 (New York, 1902–03); Hemenway on "Municipal Telephones," in *Proceedings Seventh Annual Convention League of American Municipalities* (Des Moines, Iowa, November, 1903); K. B. Judson, comp., *Selected Articles on Government Ownership of Telegraph and Telephone* (White Plains, N. Y., 1914). For statistics: United States Census, *Telephones and Telegraphs, 1912* (Washington, 1915), and statistical reports of the American Telegraph and Telephone Company (New York). See PUBLIC UTILITIES, REGULATION OF.

TELEPHONE, WIRELESS. See WIRELESS TELEGRAPHY AND TELEPHONY.

TEL′EPHUS (Lat., from Gk. Τήλεφος). In Greek legend, a king of Teuthrania, in southern Mysia (q.v.). Auge, the daughter of King Aleos of Tegea (q.v.), was loved by Hercules and bore him a son, Telephus. In anger her father inclosed mother and child in a chest and cast them into the sea. The chest floated across the Ægean to the mouth of the Caĕus, where Teuthras married Auge and brought up Telephus, who succeeded him on the throne. This early version was modified by the tragedians. Auge became priestess of Athena, and the child was born, or at any rate exposed, on Mount Parthenion, where it was suckled by a doe, and (in one version) found by Hercules. Auge meanwhile was cast into the sea and brought to Mysia, where she was adopted by Teuthras. Later, Telephus came to Mysia on account of an oracle, helped Teuthras against powerful enemies, and was rewarded by the hand of Auge. On the marriage night mother and son recognized each other. When the Greeks were on their way to Troy they landed by mistake in the territory of Telephus and harried the country. Telephus defeated the invaders, but was himself wounded by Achilles. As an oracle informed him that only the man who had wounded him could cure him, he went to Greece, and, as the Greeks needed his guidance to reach Troy, they yielded and Achilles healed the wound with rust from his spear. Telephus then guided the Greeks to Troy but refused to take part in the war, since his wife, Astyoche, was a daughter (or sister) of Priam. The whole story of Telephus was represented on the smaller frieze of the Great Altar of Pergamon (see PERGAMON, GREAT ALTAR OF), and his battle with Achilles in the west pediment of the Temple of Athena Alea at Tegea (q.v.). Consult: Jahn, *Telephus und Troïlos* (Kiel, 1841); id., *Telephus und Troïlos und sein Ende* (ib., 1859); Pilling, *Quomodo Telephi fabulam et scriptores et artifices veteres tractaverint* (Halle, 1886).

TELESCOPE (from Gk. *τηλεσκόπος, tēleskopos*, far-seeing, from *τῆλε, tēle*, afar + *σκοπεῖν, skopein*, to look). Essentially a lens or mirror to form an image of a distant object, together with a microscope to enable the observer to examine this image in detail, or a photographic camera or some form of spectroscopic apparatus. The invention of the telescope was doubtless accomplished in Holland, but there is some confusion and controversy to be encountered in attempting to determine the original inventor. Tradition has it that early in the seventeenth century one Jansen, a spectacle maker of Middelburg, Holland, constructed a telescope about 16 inches long which he exhibited to Prince Maurice and the Archduke Albert, who, appreciating the importance of the discovery, paid him a sum of money to keep it concealed. Another spectacle maker, Lippershey, made application (1608) to the States General for a patent for a telescope, as also did Metius, a professor of mathematics, but in the former instance, at least, it was refused, as the apparatus was already known. It seems certain that the instrument was known more or less about Europe, but the honor of its invention is usually given to Galileo, who was the first to describe it and exhibit it in a complete form (May, 1609). Galileo having heard that a device to magnify distant objects had been constructed in France or Holland, immediately set to work to produce such an instrument. His telescope, similar in form to the modern opera glass (q.v.) and composed of a convex object glass and a concave eyepiece, as first constructed had a magnifying power of 3 times, but this was subsequently increased to 30 times, and Galileo was able to discover the satellites of Jupiter, the mountains of the moon, and other celestial objects. To Kepler we owe the discovery of the principle of the astronomical telescope with two convex lenses, and the description of such an instrument is contained in his *Catoptrics* (1611). This idea was actually employed in a telescope constructed by Father Scheiner (*Rosa Ursina*, 1630), and such telescopes were used in increasing numbers until the middle of the seventeenth century, when they were practically universal, and improved construction made possible Huygens's discovery of Titan, the brightest satellite of Saturn.

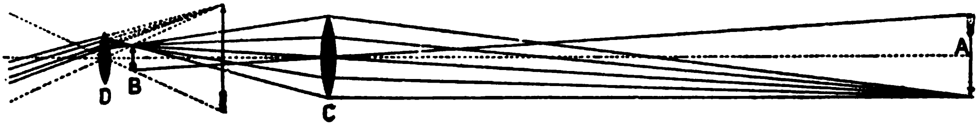


DIAGRAM OF ASTRONOMICAL TELESCOPE.

In the accompanying diagram *C* represents a convex lens, the object glass of a telescope; *A* is a distant object and *B* is a real and inverted image formed by the lens. From the discussion of lenses in the article on Light (q.v.) it will appear that in order to obtain a large image a lens of long focal length is essential, so that for a telescope an object glass with large radii of curvature is needed. This, however, is not feasible in actual practice beyond a certain point, as was found by the early astronomers after experiences with telescopes having focal lengths as great as 600 feet; and lenses of shorter focal length but of improved construction were adopted. The next question involved is the size of the object glass, technically called its aperture. The larger the lens the greater will be the amount of light transmitted. The pupil of the eye through which the light producing an image passes normally is about ⅕ of an inch in diameter, consequently as much more light will pass through the telescope as the square of the diameter of the object glass is times greater than the square of the diameter of the pupil. But if the image formed is too large, then the light will be distributed and the image will lack brilliancy and not be plainly visible. Taking these facts into consideration, it would appear that the greater the focal length of the lens and the greater its surface, the more satisfactory would be the image produced. This would be the case were it not for the fact that both spherical and chromatic aberration (q.v.) increase with the aperture of a lens, and that the larger the piece of glass, the greater the difficulty of securing homogeneity and freedom from imperfections. Increasing the focal length increases the difficulties involved in mounting the telescope as well as in the manufacture of the objective itself.

The image furnished by the object glass is inverted and is merely magnified by the eyepiece. In what is known as the terrestrial telescope there is an additional lens or lenses added to erect or invert the image so that it will appear to the eye in its natural position, the erecting lens and the eyepiece being in reality a compound microscope to view the image furnished by the objective. In the diagram *C* is the object glass, *B* is the inverted image formed by the rays coming from a distant object in the direction *A*, *E* and *G* serve merely to invert the image *B* and form it anew and erect at *H*, where it is observed by the eyepiece *D*.

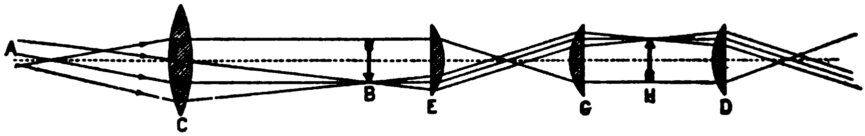


DIAGRAM SHOWING TERRESTRIAL TELESCOPE.

Other arrangements of the terrestrial eyepiece could be mentioned, but the one described is one of the earliest and simplest.

While the greatest care must be expended on calculating and constructing the object glass, the eyepiece is by no means unimportant. As the magnifying power of the telescope (the ratio of the angles formed by lines drawn to the extremities of the image and the object) is equal to the quotient obtained by dividing the focal length of the objective by that of the ocular, it would be of advantage to use a lens of comparatively large curvature; but here again chromatic and spherical aberration must be considered, for sharpness and distinctness are as essential as high magnification. In practice eyepieces vary considerably, depending on the use to which they are to be put. Generally they consist of two achromatic lenses, one convex, known as the field lens, which brings together the outer rays of the beam, while the lens nearest to the eye may be either positive (convex) or negative (concave). In case a micrometer is used to measure the image a positive lens is employed and the combination, which is known as a Ramsden eyepiece, though not quite achromatic, has a flat field. For mere observation the Huygenian eyepiece, with a negative lens of one-third of the focal length of the field lens, is preferable. The addition of lenses to the eyepiece diminishes the supply of light and destroys the brightness of the image. Accordingly in the terrestrial telescope, while the erecting lens inverts the image to its proper position, yet the image is not as bright as in the case of the opera glass, which has far less magnifying power.

The difficulties due to spherical aberration were early experienced by opticians and astronomers, and in an attempt to obviate them astronomical telescopes were constructed of considerable focal length and power. From observations made with such instruments by Huygens, who was the pioneer in this line, he was able to present the first explanation of Saturn's rings (1659). He constructed a telescope 300 feet in length, which magnified 600 times, while the telescope used by Cassini to discover the fifth satellite of Saturn (Rhea) was built by Campani of Rome and magnified about 150 times. The diameter of Venus was determined in 1722 by Bradley with a telescope of 212 feet focal length. These telescopes of extreme length were known as aërial telescopes, and naturally their mounting and manipulation presented many difficulties. In spite of these awkward conditions, valuable observations were made and ingenious appliances introduced to facilitate the operations. It was proposed by Prof. David P. Todd as late as 1911 to construct a long-focus open-air telescope of steel box-girder construction so reënforced as to be unyielding and rigid. With this it was hoped to cut down spherical aberration just as was done by the earlier astronomers and secure the advantages of long-focus lenses under modern conditions.

The invention of the achromatic object glass by Dollond in 1757–58 and the improvement of optical flint glass, which commenced in 1754, soon made possible the construction of improved telescopes; but these were all of modest dimensions, and until well into the nineteenth century few if any object glasses were constructed greater than 12 inches in diameter. The discovery of methods of making large disks of flint glass was made by Guinand, a Swiss mechanic, who then became associated with Fraunhofer (q.v.), and telescopes as large as 10 inches aperture were readily made. His successors made instruments with object glasses 15 inches across. The next successful manufacturer of telescope lenses was Alvan Clark (q.v.), of Cambridgeport, Mass., who, from the time when an object glass manufactured in his shop was purchased by the Rev. W. R. Dawes of England, gradually achieved the highest rank as a maker of telescope lenses. With him was associated his son Alvan G. Clark (q.v.). At the Cambridgeport works were constructed the lenses not only for the leading American observatories, but also for the Imperial Russian Observatory at Pulkova and other European institutions. To-day there are other makers of refracting telescopes in the United States, notable among whom are Brashear, Warner, and Swazey, while in Europe, Grubb of Dublin, Henry Brothers of Paris, and Steinheil in Germany are notable for their work.

The formation of an image by a concave mirror has been made use of in the reflecting telescope, of which numerous varieties have been devised and with which many of the most important astronomical discoveries have been made. The principle of this instrument will be apparent from the following diagram and explanation:

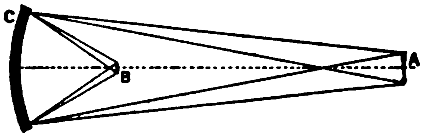
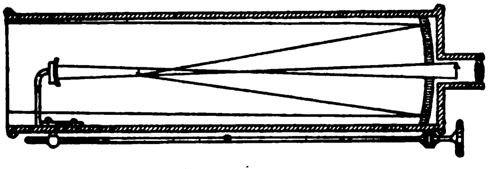


DIAGRAM SHOWING FORMATION OF AN IMAGE BY A CONCAVE MIRROR.

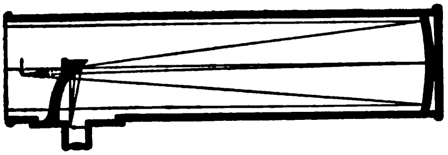
C is a concave mirror on which rays from a point of a distant object, *A*, fall. Following the law of reflection, these rays will be reflected and will be united at *B*, the focus for rays from the given point. The object *A* is made up of a number of such points; consequently at *B* there will be a number of points where the rays from *A* are collected and an image of the original object will be formed. If the rays come from an object infinitely distant, or in other words are parallel, they will converge at the principal focus, which is one-half of the radius of curvature. This will be the case in a mirror of large radius and for rays that are incident, not far from the axis; but if the mirror is large, then the rays near its circumference will not be brought to a focus at the point *B*, but nearer to the mirror, and consequently a blurred image will be produced. This is known as spherical aberration and is discussed under that head. Theoretically this could be remedied by the construction of a mirror of parabolic section, as the configuration of such a mirror is such that all parallel rays are brought to a focus in the same point. This is extremely difficult of attainment, as the most minute amounts of material must be removed from a spherical surface in order to make it parabolic; nevertheless, modern opticians, by refinements in working and testing, are able practically to realize this condition. When an image is formed in this way it can be viewed either by being received on a screen or it can be observed with an eyepiece or a simple microscope.

Father Zucchi, an Italian Jesuit, was the first to use an eye lens to view the image produced by a concave mirror (1616–1652), but to Gregory is due the first description of a telescope with a reflecting mirror, and the instrument has since been known by his name. Gregory (1638–75), with others, realized the shortcomings of a telescope with lenses and believed that the manufacture of concave mirrors would be attended with far less difficulty. An actual working instrument based on this principle was devised and constructed by Isaac Newton. With a telescope formed by a mirror of 6½ inches focal length, which magnified 38 times, he was enabled to make important observations. In these telescopes the great difficulty was viewing the image, as the eyepiece and the head of the observer would cut off a large portion of the incident rays. In the Gregorian telescope this was obviated by the interposition of a second concave mirror, which reflected the rays to the eyepiece, as is shown in the following diagram:



GREGORIAN TELESCOPE.

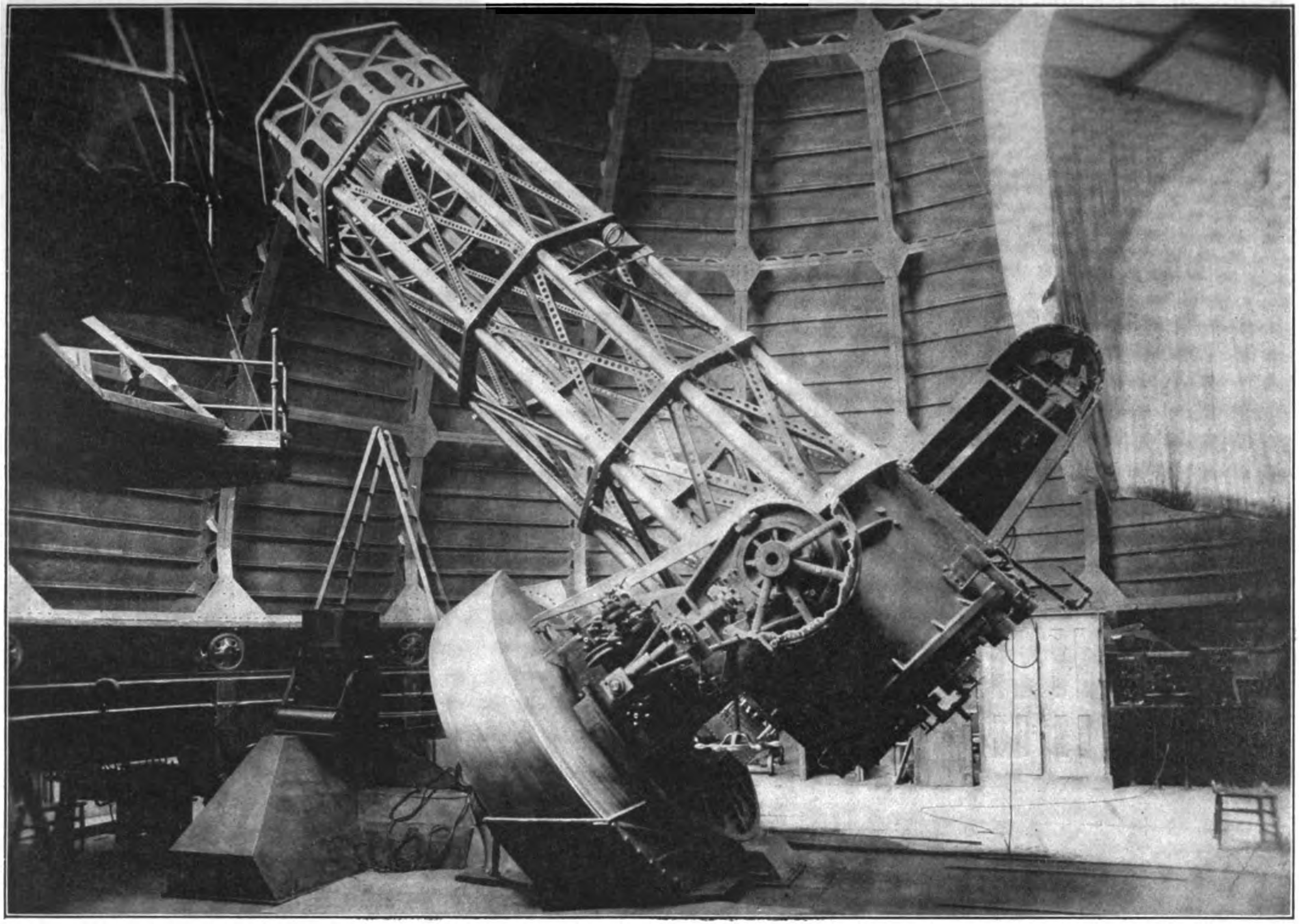
Newton used a plane mirror placed at an angle of 45° to the axis, which reflected the rays into an eyepiece arranged as in diagram below.



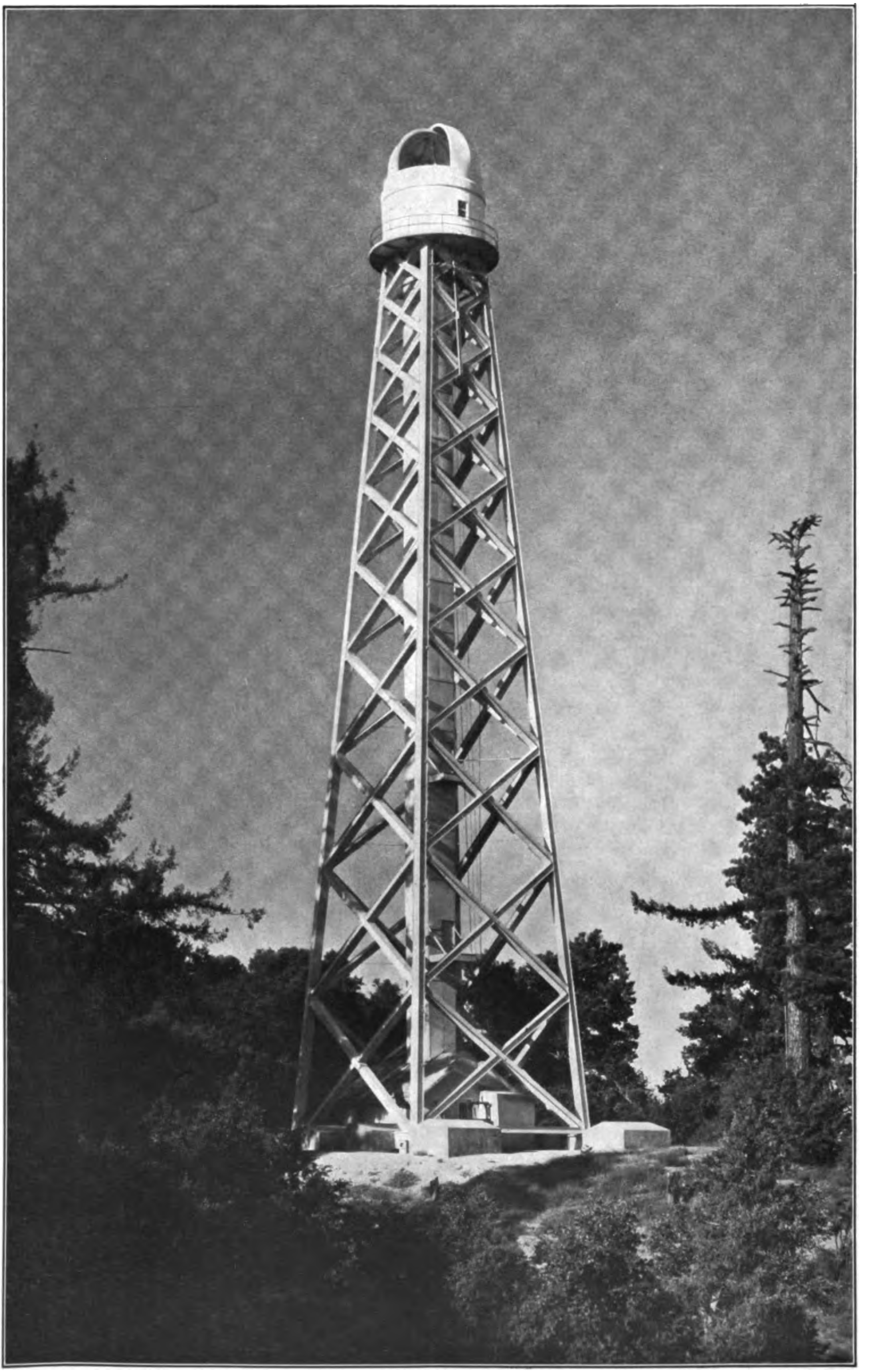
NEWTONIAN TELESCOPE.

Draper used a total reflection prism instead of the plane mirror with considerable success, being one of the few astronomers in the United

REFLECTING TELESCOPE



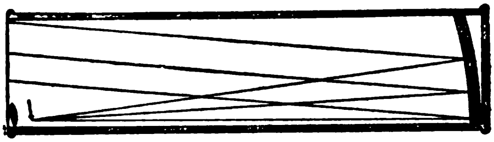
MOUNT WILSON SOLAR OBSERVATORY
60-INCH REFLECTING TELESCOPE, CARNEGIE INSTITUTION OF WASHINGTON



MOUNT WILSON SOLAR OBSERVATORY
150-FOOT TOWER TELESCOPE, CARNEGIE INSTITUTION OF WASHINGTON

States to construct a reflecting mirror. Cassegrain employed a convex mirror instead of a concave one.

Herschel obtained satisfactory results by tilting his mirror and placing the eyepiece below the axis of the instrument, so that it was not in the way of the incident rays. Herschel's mirrors were as large as 4 feet in diameter, with a tube 40 feet in length.



HERSCHEL'S TELESCOPE.

The reflecting telescope was extensively used because there was no chromatic aberration caused by refraction. Spherical aberration was, however, present and was a serious drawback. According to geometrical calculations, as has been said, there would be no spherical aberration if a parabolic mirror was used, as all the rays from a distant object would come to a focus at one point. The grinding of a parabolic mirror, however, was attended by many difficulties and was practically impossible except to a few opticians.

The mirrors for reflecting telescopes were usually made of speculum metal, which is composed of a mixture of copper and tin, until Liebig discovered the method of depositing a film of silver on a glass surface.

The use of silvered glass for mirrors was suggested by Steinheil, and later by Foucault, and has met with general adoption, as it not only facilitates the construction of the mirror, but makes possible its resilvering at any time without the destruction of its configuration. The reflecting telescope is available for photographic or spectroscopic work, as well as for visual observation, but the chief defects, as mentioned, are the difficulty of grinding the metal or glass to true parabolic shape and the deformation of the mirror in its mounting, owing to its great mass.

For many years the most celebrated reflecting telescope was that of Lord Rosse, whose mirror was 6 feet across. This was completed in 1845 and erected at Birr Castle, Parsonstown, in Ireland. While famous for its size, except for studies of the spiral form of nebulæ this telescope has never been used in making discoveries of prime importance. In 1914 it was presented to the South Kensington Museum of Science as an historic relic. Of much greater scientific importance as well as of large size are the reflectors of Harvard College, Mount Wilson Solar Observatory, and the Canadian Observatory near Victoria, British Columbia. The Harvard College reflector belonged originally to the late Dr. A. A. Common of Ealing, England. Using the largest glass disk that could be obtained, 5 feet in diameter, Dr. Common produced a perfect mirror, which is mounted equatorially. This telescope is of the Newtonian type and has been particularly useful in celestial photography.

In recent years an important use was made of a reflecting telescope to photograph the nebulæ with the 3-foot Crossley reflector of the Lick Observatory (q.v.). This instrument was made by Dr. A. A. Common and was presented to Lick Observatory by Edward Crossley. Prof. James T. Keeler, the director, remounted this instrument and in 1899 made a remarkable series of photographs which indicated the formation and general character of the nebulæ.

This work was followed by some notable researches at the Mount Wilson Solar Observatory, where there were installed the largest reflecting telescopes yet to be constructed. These were employed both photographically and spectroscopically for the study of the sun, stars, and nebulæ. The first of these telescopes was the 60-inch reflector, made from a plate of glass 8 inches in thickness and weighing 1 ton. The glass was cast at the French Plate Glass Works of St. Gobain, but the disk was ground and polished at the shop of the Mount Wilson Observatory. This instrument was completed in 1908, and it and its mounting proved most satisfactory, especially for photographic and spectroscopic work. With an 80-foot Cassegrain combination this telescope was effectively used in the determination of stellar parallax. The success of the 60-inch telescope led to the desire for a still larger reflector and the construction of one of 100 inches in diameter was attempted, a suitable disk of glass 20 centimeters in thickness being secured after great trouble at the French works at St. Gobain. This was properly ground and figured and the 60-inch plane mirror required for its testing made at the instrument shop of the Mount Wilson Observatory at Pasadena. The mounting for this telescope required the most refined mechanical engineering in order to support and move the heavy disk of glass, and it was found that by proper control of the temperature of the mounting that much of the distortion could be eliminated.

The new reflector of the Dominion Observatory, near Victoria, British Columbia, has a mirror 6 feet, 1 inch in diameter, weighing almost 2 tons. It was made by John A. Brashear Company of Pittsburgh and is supplied with an equatorial mounting. This telescope and observatory were reaching completion in 1916.

The mounting of telescopes has also kept pace with the improvement of lenses and mirrors. Newton used a ball and socket joint to mount his small reflector, and then various arrangements of framework were employed for the aërial telescopes and later for the large reflectors. The first equatorial (q.v.) mounting is ascribed to Lassel. In England telescopes were mounted by having the polar axis supported at each end, but the German system, where the mounting is in the centre and the weight of the telescope is balanced by counterpoises, is now generally used for large refractors, and a modified form is employed for reflectors, as shown in the accompanying plate.

The modern telescope is not merely an instrument for visual observation, but in connection with photography and the use of the spectroscope (q.v.), especially in its adaptation to the spectroheliograph and other kindred instruments, its field has been widely increased. Fraunhofer, who first used the spectroscope instead of the visual eyepiece, was able to record the spectra of Venus and Sirius, and since that time the combination of telescope and spectroscope has made possible some of the most important advances in astronomy. One of the earliest applications of photography was to the heavens, and the object glass of the telescope was used with the eyepiece removed, the image being formed directly on the plate. In the early stages of this work both reflecting and refracting telescopes were used, but with the latter it was found that special lenses were necessary in which the correction for chromatic aberration was arranged with regard for the actinic rather than the visual rays. The green, yellow, and red rays, which affect the human eye the most, do not produce the chemical effects on the photographic plate, which must be placed at the focus of the violet rays, and consequently a photographic objective is constructed so as to bring the blue and violet rays to a single focus. One of the first telescopes constructed for this purpose was by Lewis M. Rutherfurd (q.v.), with which many fine pictures of the moon were made. At the Lick Observatory photographic work with the large telescope has been accomplished most successfully by using an extra lens at the objective, which brings the photographic rays to a focus instead of the visual rays. At the Yerkes Observatory of the University of Chicago this difficulty has been overcome by the use of color screens. The color screen is mounted in the plate holder and is of a greenish-yellow tint, which cuts off the blue rays. Orthochromatic plates are used and are affected by the rays in the middle part of the spectrum. So important is the photographic use of the telescope that in 1900 there were 18 photographic telescopes in various parts of the world engaged in making photographs for an International Star Chart to cover the entire heavens. By 1909 some of the observatories had completed their assigned work, and with normal conditions in Europe it was believed that the entire chart would be completed by 1920. See ASTROPHOTOGRAPHY.

Of the modern telescopes of interest the instrument known as the equatorial coudé of the Paris Observatory is worthy of mention. The observer and instrument are in an ordinary building, while mirrors are so arranged as to reflect the light into the telescope and then to the eyepiece. The tube of the telescope is in the form of an elbow, whence its name, with one arm forming the polar axis. This instrument has both visual and photographic object glasses 23½ inches in diameter.

The great telescope of the Yerkes Observatory of the University of Chicago at Williams Bay, Lake Geneva, Wisconsin, is the largest refracting telescope with an equatorial mounting. This instrument was mounted in a special observatory. (For illustration, see OBSERVATORY.) The objective, which is 40 inches in diameter and has a focal length of nearly 62 feet, weighs, when mounted in its cell, about 1000 pounds. The crown-glass lens, which is 2½ inches thick at the centre and ¾ inches at the circumference, weighs 200 pounds, and is separated from the flint-glass concave lens by 8⅝ inches. The latter weighs over 300 pounds and is about 1½ inches thick at the centre and 2 inches thick at the edges. The telescope itself is mounted on a cast-iron column of four sections bolted together and resting on a cast-iron foot, which in turn rests on a concrete foundation. The clock room is located in the upper part of the cast-iron column and contains the mechanism for driving the telescope. The observatory is provided with a rising floor for the convenience of the observer, who is thus able to use the telescope in comfort, irrespective of its elevation.

In an attempt to secure a still larger refractor an instrument of quite different form was built for the Paris Exposition of 1900 by M. Gauthier. The object glasses were 49 inches in diameter and the tube 197 feet in length, fixed in a horizontal position, its axis being due north and south. Light was reflected into the tube by a siderostat, an instrument invented by Foucault, on which the direct rays from the heavens fall. Instead of the telescope being moved about its polar axis, as would happen with an equatorial, the mirror of the siderostat is given such a motion that it neutralizes the movement of the earth. Each lens of the Paris Exposition telescope weighed half a ton and they were constructed by M. Gauthier, who also made those for the University of Chicago telescope. Although in the horizontal telescope there is no elaborate mounting with mechanical devices, yet as much care must be expended on the siderostat as on the object glasses. The mirror forming the essential part of this instrument was 78½ inches in diameter, was 11

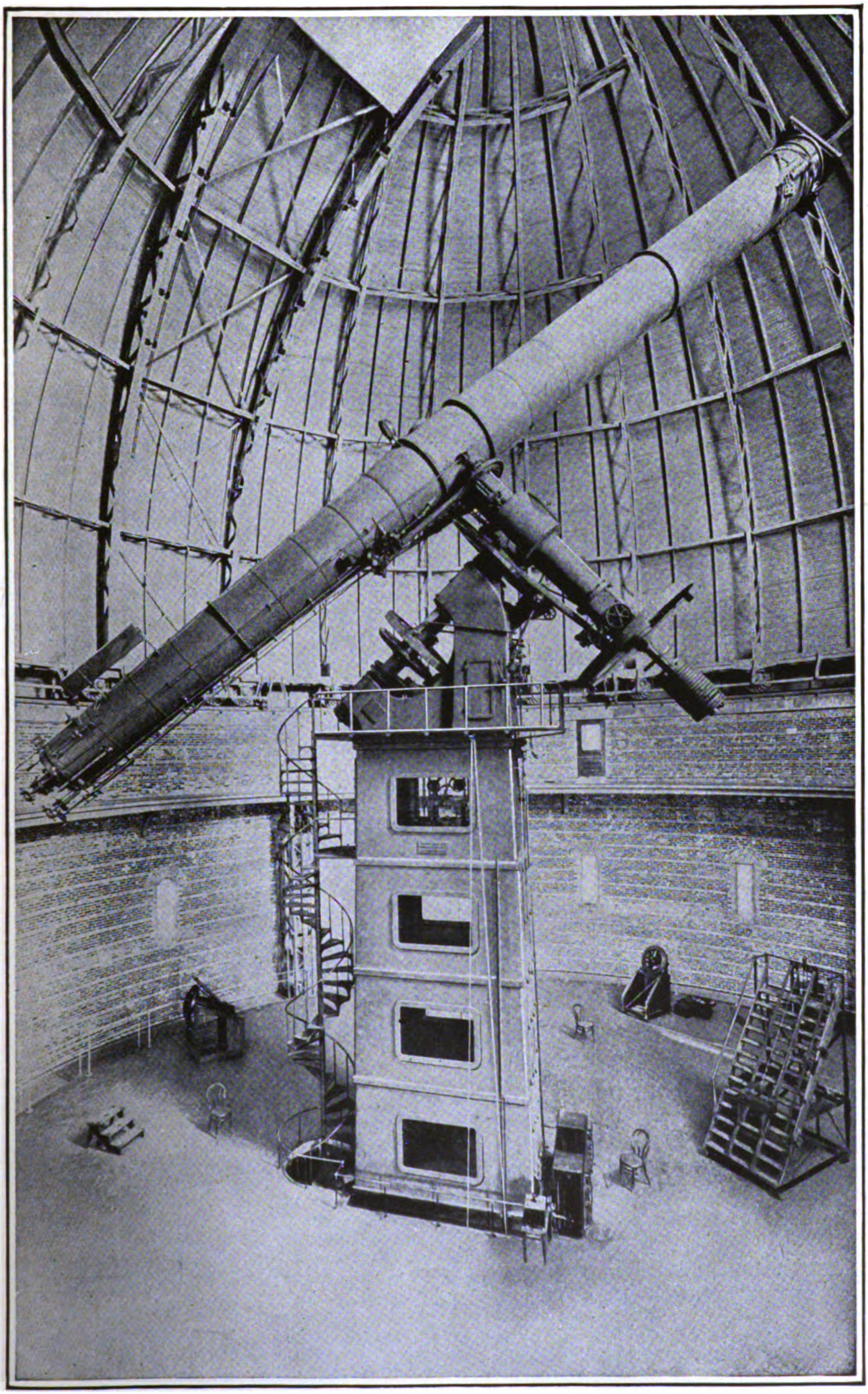
LIST OF LARGE TELESCOPES IN EXISTENCE OR UNDER CONSTRUCTION IN 1916

REFRACTORS 20 INCHES AND UPWARD

	Inches
Paris (Exhibition)	49.2
Yerkes	40.0
Lick	36.0
Meudon	32.5
Nikolaev, Russia	32.0
Potsdam, Germany	31.5
Nice	30.3
Pulkova, Russia	30.0
Allegheny Observatory	30.0
Paris	28.9
Greenwich	28.0
Berlin	27.5
Vienna	27.0
Greenwich	26.0
McCormick Observatory, Virginia	26.0
Washington, United States	26.0
Johannesburg, South Africa	26.0
Newall's, Cambridge, England	25.0
Meudon	24.4
Cape of Good Hope	24.0
Harvard	24.0
Lowell Observatory, Arizona	24.0
Córdoba, Argentina	24.0
Santiago, Chile	24.0
Detroit, Mich.	24.0
Oxford, England	24.0
Swarthmore College, Pennsylvania	24.0
Hamburg	23.6
Paris	23.6
Princeton, N. J.	23.0
Edinburgh (City Observatory)	21.2
Mount Etna	21.8
Mount Porro, Turin (Italy)	20.5
Chamberlin Observatory, Denver, Col.	20.0
Manila, Philippine Islands	20.0
Oakland, Cal.	20.0

REFLECTORS 2 FEET 6 INCHES AND UPWARD

	Ft.	In.
Mount Wilson	8	4
Victoria, British Columbia	6	1
Lord Rosse	6	..
Dr. Common (Harvard Observatory)	5	..
Mount Wilson	5	..
Melbourne	4	..
Paris	4	..
Toulouse	2	8.5
Simeis, Crimea	3	4
Lowell Observatory, Mexico	3	4
Carre, near Geneva	3	3.4
Mendun	3	3.0
Hamburg	3	3.0
Ann Arbor	3	1.5
Santiago, Chile	3	0.6
Cambridge University	3	..
Birr Castle, Ireland	3	..
South Kensington	3	..
Crossley (Lick Observatory)	3	..
Marseilles	2	7.5
La Plata, Argentina	2	7.5
Greenwich	2	6.0
South Kensington	2	6.0
Allegheny	2	6.0
Helwan, Egypt	2	6.0
D'Esterres Observatory, Surrey, England	2	6.0
Sidmouth, England	2	6.0



THE FORTY-INCH YERKES TELESCOPE OF THE UNIVERSITY OF CHICAGO.

inches in thickness, and weighed 3600 kilograms (nearly 8000 pounds). So far as is known this telescope never was entirely completed for scientific observations, though used by visitors at the Exposition.

The telescope with fixed tube, as used in the more or less extemporized arrangements of the transit of Venus expedition of 1882, and in the uncompleted instrument of the Paris Exposition, however, developed into a series of interesting and valuable instruments at the Mount Wilson Observatory, especially in connection with the photographic study of the sun and with the spectrograph and spectroheliograph as well as with other work. Instead of the siderostat a cœlostat, a similar device, but with a second mirror, was employed, where the movable plane mirror made a complete revolution but once in 48 hours and reflected its beam into a second plane mirror, whence it was reflected to the telescope proper, which may be either a reflector or a refractor. The Snow reflector of the Mount Wilson Observatory is a horizontal reflector provided with mirrors that will give an image of the sun either 6.7 inches in diameter or 16 inches in diameter. The first of these mirrors is of 60 feet focal length and the second of 143 feet. The cœlostat is mounted on a masonry pier, and the instrument is protected by a ventilated covering which keeps off the direct rays of the sun. This horizontal telescope can be used either directly, or with the spectroheliograph, for photographing the sun. In addition to the horizontal telescope, there are at Mount Wilson two vertical or tower telescopes, one carried on a 60-foot tower and used with a 30-foot spectrograph and spectroheliograph, and the other on a 150-foot tower with a 75-foot spectrograph and spectroheliograph. In these two telescopes the cœlostat is mounted at the summit platform and the beam is reflected down vertically through a lens. These telescopes have various lenses for special purposes, varying in focal length, as needed. The vertical tubes of the two telescopes have a double sheathing of metal, and chambers, or wells, excavated in the solid rock on which the towers are founded afford constant temperature for the mirrors, prisms, and gratings of the spectroscopes.

Bibliography. Drude, *Theory of Optics* (London, 1902); Chauvenet, *Spherical and Practical Astronomy*, vol. ii (Philadelphia, 1863); for history and theory, consult Lockyer, *Stargazing, Past and Present* (London, 1878); Agnes M. Clerke, *History of Astronomy* (London, 1908); G. W. Ritchey, "On the Modern Reflecting Telescope and the Making and Testing of Optical Mirrors," *Smithsonian Contributions to Knowledge*, vol. xxxiv, No. 1459 (Washington, 1904). For more recent developments consult various articles in the *Astrophysical Journal*, especially by the following: Wadsworth, Reese, Ritchey, and Hale; also *Observatory* (London), especially June and July, 1898, and June, 1914. See ASTRONOMY; OBSERVATORY; LIGHT; MOUNT WILSON SOLAR OBSERVATORY; SPECTROGRAPH; ETC.

TEL′ESCRIBE (from Gk. *τῆλε*, *tēle*, afar + Lat. *scribere*, to write). An invention of Thomas A. Edison brought out in 1914 to record permanently on a phonograph a conversation carried on over a telephone line. The apparatus operates by placing the ordinary telephone receiver on the box of the telescribe in proximity to the receiving diaphragm of a loud-speaking telephone transmitter whose vibrations are transmitted to the receiving diaphragm of a dictating machine or phonograph. There is also a watchcase receiver connected with the telescribe and the telephone line which is used by the hearer. The vibrations of the diaphragm in the telephone receiver when placed on the telescribe transmitter are duly transmitted to the recorder of the talking machine or phonograph. When the telephone receiver is placed on the telescribe box an automatic switch is operated and the talking machine is put in operation recording the conversation. It is possible to record only as much of the conversation as the hearer desires, and at the same time every word that is spoken in the ordinary use of the telephone can be heard. The record made on the telescribe can be repeated as often as desired and the instrument was thought to be an important adjunct to the practical use of the telephone.

TEL′ESIL′LA OF AR′GOS (Lat., from Gk. *Τελέσιλλα*) (c.510 B.C.). A Greek poet. She was born at Argos and is said to have served in the Argive army against Sparta. Her lyrics are lost except for two lines found in Bergk's *Poetæ Lyrici Græci*, vol. iii (5th ed., Leipzig, 1914).

TELESIO, tĕ-lā′zyō, BERNARDINO (1509–88). An Italian philosopher, born at Cosenza near Naples. He studied at Rome and Padua, lectured for a time at Naples, and later founded the Academy of Cosenza. Telesio headed the great southern Italian revolt against the mediæval Aristotelianism, thus paving the way for more scientific methods of thought. His greatest work, *De Rerum Natura* (new ed., 2 vols., 1910–13), appeared at Rome in 1565. His psychology was of rationalistic tendency. After his death his works were placed on the Index by the church. Consult Bartholmess, *Dissertatio de B. Telesio* (Paris, 1849).

TELETS (tĕ-lĕts′) **LAKE.** See ALTIN.

TELEU′TOSPORE. The winter spore of rusts. See UREDINALES.

TEL′FORD, JOHN (1851–). An English Wesleyan Methodist clergyman and editor, born at Wigton, Cumberland. He graduated from Didsbury College in 1873, entered the ministry, and was elected to the Legal Hundred in 1906. From 1905 he was editor of the *Wesleyan Methodist Magazine* and connectional editor, and he published: *Life of John Wesley* (1886; new ed., 1910); *A History of Lay Preaching in the Christian Church* (1897; 2d ed., 1912); *A Popular History of Methodism* (3d ed., 1899); *A Sect that Moved the World* (1907); *Man's Partnership with Divine Providence*, the Fernley lecture of 1908; *The Life of James Harrison Rigg* (1909). Telford edited *Wesley's Veterans* (5 vols., to 1913).

TELFORD, THOMAS (1757–1834). An eminent Scottish engineer, born in Eskdale, Dumfriesshire. At the age of 14 he became a stonemason. In 1780 he removed to Edinburgh, and in 1783 he repaired to London, where he was appointed in 1784 to superintend the erection of the resident commissioner's house at Portsmouth dockyard. In 1787 he was appointed surveyor of public works for Shropshire; and his two bridges over the Severn at Montford and Buildwas and other works gained for him the planning and superintendence of the projected Ellesmere Canal, to connect the navigation of the Severn, Dee, and Mersey (1795–1805). In 1801 he was retained by the government to report on desirable public works for Scotland. As a consequence, the plan of a canal from Inverness to Fort William was revived, and its planning and construction intrusted to Telford. (See CALEDONIAN CANAL.) He constructed more than 1000 miles of road in the Highlands, Lanarkshire, and Dumfriesshire and about 1200 bridges, besides churches, manses, harbors, etc. He superintended the construction of the road from London to Holyhead, including the erection of numerous bridges—among others, the Menai Straits suspension bridge. His life, entitled *The Life of Thomas Telford, Civil Engineer, written by himself*, was published in 1838. In America Telford is chiefly known for the system of road construction that bears his name. Consult Samuel Smiles, *Lives of the Engineers*, vol. iii (new ed., New York, 1905). From its foundation in 1818 he served as president of the Institution of Civil Engineers, which body awards a Telford gold medal. See ROAD.

TELFORD ROAD. See ROAD.

TEL′HARMO′NIUM (Neo-Lat., from Gk. *τῆλε*, *tēle*, afar + *ἁρμονία*, *harmonia*, joint, concord, harmony). The name applied by the inventor, Dr. Thaddeus Cahill, to a device for the production of music at any distance from the performer, by means of electric currents. The fundamental idea involved in Cahill's system is the combination at will of alternating currents of any frequency and amplitude, thereby producing a current having a wave shape of the form corresponding to any musical note of any timbre. This composite current, if allowed to pass through a telephone receiver, will then cause the diaphragm to vibrate, producing a sound wave corresponding exactly to the current wave. The sources of current are a number of small alternators, each alternator producing a sine-wave current of a definite frequency. The keyboard is similar to that of an organ; the keys operate switches so as to bring the several alternators into action on the lines or mains as required. The notes produced are of remarkable purity, being surpassed only by that of a good string. The performer has absolute control over the notes, both as to expression and timbre; he can produce at will the note of practically any instrument, and even notes of an entirely new quality. Since any number of receivers can be connected to a single keyboard, it is possible for a single performer to be heard in practically any number of places at one time, and a distribution system was planned whereby music could be transmitted to a large number of subscribers. Daily concerts with an approved programme in this way would be available.

TELINGS, tĕ-lĭngz′, or **TELINGAS**, tĕ-lĭŋ′-gȧz. See KLINGS; TELUGUS.

TELL, WILLIAM. The hero of a Swiss legend, in its main features common to all Aryan peoples. It is found in the Icelandic Thidreksaga, in Saxo Grammaticus, in old English ballads, in Persian poetry, and elsewhere. All tell of a master marksman and of a tyrant who compels him to pit faith in his skill against his natural instinct as a father. The Swiss legend, narrated with much circumstance, is that a mythical Austrian bailiff, Gessler, demanded homage to the cap of Austria (1307) in the market place at Altdorf. Tell refused this, was condemned to death, but permitted to ransom himself by shooting an apple from his son's head. On signifying his intent to have killed Gessler if he had shot his son, Tell was fettered and carried to the bailiff's boat. A storm arose and Tell was released that he might save the boat. This he did, then leaped ashore, and killed Gessler. The story then speaks of a revolt in which Tell takes part and by which the Forest Cantons gain independence. The oldest chroniclers know nothing of the tale. It appears timidly, late in the fifteenth century, in *Das weisse Buch*, and more boldly in Tschudi's *Chronicon* (c.1550). The most famous version of the story is Schiller's drama *Wilhelm Tell* (1804). Consult: Rothe, *Die dramatischen Quellen des Schillerschen Tell*, in "Forschung en zur deutschen Philologie" (Leipzig, 1894); Ferdinand Schmidt, *William Tell*, Eng. trans. G. P. Upton (Chicago, 1904); and for historical criticism of the saga, E. L. Rochholz, *Tell und Gessler* (Heilbronn, 1877).

TELL CITY. A city in Perry Co., Ind., 53 miles by rail east of Evansville, on the Ohio River, and on the Southern Railway (Map: Indiana, D 9). There are chair, desk, and furniture factories, a woolen mill, and a foundry. Tell City was founded by the Swiss Colonization Society in 1857. Pop., 1900, 2680; 1910, 3369.

TELL EL AMARNA, tĕl ĕl ȧ-mär′nȧ. A place in Middle Egypt, on the right bank of the Nile, about midway between Thebes and Memphis. It includes the Arab villages Hagg-Kandil and Et Tell and is the site of the ancient city of Akhetaten, founded by the heretic King Amenophis IV (q.v.), also known as Akhenaten, who abandoned Thebes and removed his residence thither. A splendid temple and palace were built, and the city increased so fast that it extended to the opposite bank of the Nile; but its existence was brief. After the death of Amenophis and the triumph of the orthodox religion, the royal residence was transferred to Thebes and the new city rapidly fell into decay. The ruins of the temple and palace are to be seen, and in the vicinity are interesting rock-hewn tombs, constructed for the courtiers of the royal founder of the city. In the winter of 1887–88 the archive chamber of Amenophis was discovered by some natives, and in it were found a number of cuneiform tablets containing the correspondence of the King and of his father, Amenophis III, with the governors and kings of western Asia. (See AMARNA LETTERS.) The site was explored by Petrie in 1891–92. Consult: W. M. Flinders Petrie, *Tel el-Amarna* (London, 1895); N. de G. Davies, "Rock Tombs of El Amarna," in *Archæological Survey of Egypt, Memoir, 13–18* (6 vols., ib., 1903–08); Baedeker, *Egypt* (7th ed., Leipzig, 1914).

TELL EL KEBIR, tĕl ĕl kȧ-bēr′. A village of northeastern Egypt, on the Sweet Water Canal, 18 miles east by south of Zagazig, noted as the scene of a battle between the English under Lord Wolseley and the Egyptian insurgents under Arabi Pasha (q.v.), Sept. 13, 1882. See EGYPT.

TEL′LER, HENRY MOORE (1830–1914). An American politician and cabinet officer, born at Granger, N. Y. He was educated at Alfred University, was admitted to the bar in 1856, in 1858 removed to Illinois, and in 1861 to Colorado. He was a Republican member of the United States Senate from 1876 until April, 1882, when he entered the cabinet of President Arthur as Secretary of the Interior. At the close of Arthur's administration he again entered the Senate and was reëlected in 1890 as a

Republican. A strong advocate of free silver, with 33 others he left the Republican national convention in 1896, having broken with the party on this question as early as 1893. In 1897 he was returned to the Senate as an independent Silver Republican, and in 1902 was reelected as the regular Democratic nominee. He retired from the Senate in 1909.

TEL'LER, WILHELM ABRAHAM (1734–1804). A German Lutheran theologian, born at Leipzig. In 1761 he became pastor, general superintendent, and professor of theology at Helmstedt. His *Lehrbuch des christlichen Glaubens* (1764) aroused a storm of disapproval by its strong rationalistic doctrines. In 1767 Teller became supreme consistorial councilor and provost of Kölln at Berlin, where he was elected to the Academy of Sciences. Among his notable writings was *Die Religion der Vollkommeneren* (1792).

TELLEZ, tĕl'yâth, GABRIEL (c.1571–1648). A Spanish cleric, prose writer, and dramatist, known under the pseudonym of Tirso de Molina. He was well known as a comic playwright before 1610. At his death he was prior of the monastery at Soria. His best tales, and some of his best plays, are contained in the miscellaneous collection entitled *Cigarrales de Toledo*, licensed in 1621, but apparently not published until 1624. A second collection is the *Deleitar aprovechando* (1635). Eighty-six plays are extant, although he is known to have written more than 400. The *Burlador de Sevilla*, the first work of great merit to bring Don Juan on the boards, has long been attributed to Tellez. To him we owe also a splendid treatment of a profound philosophical enigma in *El condenado por desconfiado*. He was also a master in the handling of historical subjects (*La prudencia de la mujer*) and of witty dialogue and intricate intrigue (*Don Gil de las calzas verdes* and *El vergonzoso en palacio*). Consult his *Teatro escogido*, edited by Hartzenbusch (12 vols., Madrid, 1839–42); his *Comedias escogidas*, also edited by Hartzenbusch, in the *Biblioteca de autores españoles*, vol. v (4th ed., ib., 1903); and the *Comedias de Tirso de Molina*, edited by Emilio Cotarelo y Mori in the *Nueva biblioteca de autores españoles*, vols. iv and ix (ib., 1906–07), with a good biography and an analytical catalogue of Tirso's plays. See also Ramón Menéndez Pidal, *El condenado por desconfiado* (Madrid, 1902, and in the *Bulletin hispanique*, Paris, 1904); Alfred Morel-Fatio, "La prudence chez la femme: drame historique de T. de M.," in *Etudes sur l'Espagne* (3d series, Paris, 1904); Victor Said Armesto, *La leyenda de Don Juan* (Madrid, 1908); Blanca de los Rios de Lampérez, *Del Siglo de oro* (ib., 1910); and Theodor Schröder, *Die dramatischen Bearbeitungen der Don Juan-Sage* (Halle, 1912).

TÉLLEZ-GIRÓN, PEDRO. See OSUNA, P. TÉLLEZ-GIRÓN, third DUKE OF.

TEL'LICHER'RI, or **TEL'LICHER'RY**. A seaport in the District of Malabar, Madras, India, 90 miles south by east of Mangalore, on the Arabian Sea (Map: India, C 7). Pop., 1901, 27,883; 1911, 29,372.

TELLIER, tĕl'yā', CHARLES (1828–1913). A French engineer, born in Paris. He early made a study of motors and compressed air. In 1868 he began experiments in refrigeration, which resulted ultimately in the refrigerating plant as used on ocean vessels, to preserve meat and other perishable food. In 1911 Tellier was awarded the Joest prize by the French Institute and in 1912 he was made Chevalier of the Legion of Honor. He wrote *Histoire d'une invention moderne, le frigorifique* (1910).

TELLIER, FRANÇOIS MICHEL LE. See LOUVOIS, MARQUIS DE.

TEL'LURIDE. A city and the county seat of San Miguel Co., Colo., 45 miles south of Ridgway, on the San Miguel River and on the Rio Grande Southern Railroad (Map: Colorado, B 4). The city is situated in the Rocky Mountains at an altitude of 8756 feet. Mining is the principal industry. The average annual production in gold, silver, lead, and copper is $6,500,000, chiefly in gold. Pop., 1900, 2446; 1910, 1756.

TEL'LURITE. A mineral tellurium dioxide crystallized in the orthorhombic system. It has a subadamantine lustre, and is of a yellowish-white or yellow color. It occurs as an incrustation with native tellurium in Transylvania and at various localities in Boulder Co., Colo.

TELLU'RIUM (Neo-Lat., from Lat. *tellus*, earth). A nonmetallic element discovered by Reichenstein in 1782, but first isolated by Klaproth in 1798. The element is found native in small quantities at various localities in Hungary, Transylvania, Virginia, and California. It is also found as tellurium dioxide or tellurite, as silver and gold telluride or sylvanite, as bismuth telluride or tetradymite, and in the form of other minerals, of more complex composition. It may be prepared by cautiously heating tetradymite with potassium carbonate and charcoal in a covered crucible, extracting the resulting potassium telluride (K_2Te) with water free from air, and then passing a current of air through the solution, the metal being thus deposited in the form of a powder.

Tellurium (symbol, Te; atomic weight 127.5) is a white shining, crystalline, brittle solid that has a specific gravity of 6.27, and melts at 452° C. (846° F.). Like selenium, which it greatly resembles, it exists in amorphous and crystalline modifications, the conversion of the former into the latter being accompanied by an evolution of heat. There is also an increase of electric conductivity under the influence of light, though not so marked as in the case of selenium. Tellurium combines with oxygen to form a monoxide (TeO), a dioxide (TeO_2), and a trioxide (TeO_3), the last two of which combine with water to form tellurous and telluric acids (H_2TeO_3 and H_2TeO_4 respectively), which in turn yield series of salts called respectively tellurites and tellurates. Hydrogen telluride (H_2Te) is an evil-smelling, inflammable gas similar to hydrogen sulphide in its chemical behavior. For a remarkable anomaly exhibited by tellurium see PERIODIC LAW.

TEL'LUS (Lat., earth), more commonly TELLUS MATER, and, later, TERRA MATER. The Roman goddess of the fields, who, as coworker with Ceres (q.v.), brought to maturity the seed. At her festival in January, cakes were offered to her, a pregnant sow was sacrificed, and prayers were offered to her for the protection of the seed from bird and beast and disease. Consult W. W. Fowler, *Roman Festivals* (London, 1899); Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912). See GÆA.

TEL'MANN, KONRAD. See ZITELLMANN, KONRAD.

TEL'PHERAGE (from *telpher*, from Gk. *τῆλε*, *têle*, afar + *φέρειν*, *pherein*, to bear). A form of cableway transportation (see Cableway) in which the supporting grooved-wheel trolleys or trucks are equipped with electric motors, so that each unit is self-propelling. The trolley, or telpher, as it is usually called, is supplied with current by an independent wire apart from the supporting aërial cable, and the current may be controlled by switches at points along the line either by an operator, or the switches may be made automatic and be operated by the passing of the car with its load. Telpherage is used in quarries or mineral storage plants, for loading and unloading, and in warehouses. It has the advantage over haulage systems that the mass of actuating haulage wire does not have to be supported and guided as well as kept in motion.

TELUGUS, tĕl'ōō-gōōz, or Telingas. The northeastern division of the Dravidian family, numbering over 23,000,000. They present the typical aspect of the race—medium-statured, mesocephalic to dolichocephalic in head form. The Yanadis of Nellore, considered by some authorities to be the primitive Telugus, both with respect to physical characteristics and general culture status, are markedly dolichocephalic, broad-nosed, short-statured, and dark-skinned. The castes of the Telugus, adopted through Hindu influence, run down from the Brahmans to the despised Madigas, who are leather workers. Other divisions are the Palayyakkarans and Tottlyans (cultivators); the Komatis (traders), who have their sacred book, the Kanyakapuran; the Boyas (hunters); the Bestas (hunters and fishers). Hinduism has largely, even among such primitive tribes as the Yanadis, superseded the old animistic religion of the Telugus. About the middle of the sixth century some of the Telugus made their way into Ceylon.

In its linguistic structure Telugu coincides in the main with Tamil, although it differs widely from its older cognate in phonology and vocabulary, which is strongly influenced by Sanskrit. The literature, which is outlined under the title Dravidians, is abundant and of much stylistic merit.

Bibliography. Brown, *Telugu-English and English-Telugu Dictionary* (London, 1852–54); Henry Morris, *Simplified Grammar of Telugu* (ib., 1890); Sankaranarayana, *English-Telugu and Telugu-English Dictionary* (ib., 1900); A. H. Arden, *Progressive Grammar of the Telugu Language* (2d ed., Madras, 1906); Edgar Thurston, *Castes and Tribes of Southern India* (ib., 1909); L. D. Barnett, comp., *Catalogue of the Telugu Books in the British Museum* (London, 1912); R. Caldwell, *Comparative Grammar of the Dravidian or South Indian Family of Languages* (3d ed., ib., 1913); J. Clough, *Social Christianity in the Orient* (New York, 1914).

TEM'BULAND. One of the Transkeian territories of the Cape of Good Hope Province. It is situated south of East Griqualand and has an area of 4129 square miles. Population according to the census of 1911: total, 236,086; white, 8138; colored, 227,948; females, 127,211. Tembuland was annexed to the Cape Colony Aug. 26, 1885.

TÉMÉRAIRE, tā'mā'râr', The. A French battleship captured by the English in the battle of the Nile in 1798. In 1805 she took part in the battle of Trafalgar and was destroyed in 1838. The "Fighting *Téméraire*" (1839), a painting by J. M. W. Turner (q.v.), hangs in the National Gallery, London.

TEMESVÁR, tĕm'ĕsh-vär. A royal free city and capital of the county of Temes, Hungary, on the Béga Canal, 62 miles southeast of Szegedin (Map: Hungary, G 4). It consists of an outer and an interesting inner town or fortress. There are a Roman Catholic cathedral built by Marie Theresa, a Greek cathedral, immense barracks, and an arsenal (the castle built by Hunyady in 1442). The commander's palace, the Greek Orthodox Bishop's palace, and a Gothic column (40 feet high), by Max, erected to the memory of the town's defenders of 1849, are among the noteworthy structures. There is a museum of art, natural history, and antiquities. The town has a royal tobacco factory and manufactures cloth, matches, fertilizers, paper, and leather. Temesvár became a town in the thirteenth century. It was destroyed by the Tatars in 1242. From 1552 to 1716 it was held by the Turks, from whom it was taken by Prince Eugene. In 1849 it successfully resisted the attack of the Hungarian insurgents under Vecsey. On Aug. 9, 1849, the Hungarians under Bem and Dembinski were defeated near Temesvár by the Austrians under Haynau. Pop., 1900, 59,229; 1910, 72,555, mostly German Catholics.

TEMME, tĕm'me, Jodocus Donatus Hubertus (1798–1881). A German criminologist, politician, and novelist, born at Lette, Westphalia. He studied law at Münster and Göttingen, and became vice president of the Provincial Court of Appeals at Münster in 1848. His attitude as a leader of the Extreme Left in the Prussian as well as in the German National Assembly involved him in a trial for high treason, and, although acquitted, he was dismissed from government service in 1851. In the following year he accepted the professorship of criminal law at Zurich. He was best known as the author of more than 150 novels and stories, artistically of little importance, dealing with criminal schemes, among them: *Deutsche Kriminalnovellen* (1858–59), *Kriminalnovellen* (10 vols., 1860–64), *Dunkle Wege* (1862), *Schwarzort* (1863), *Die Heimat* (1868), and *Die Generalin* (1877). Consult S. Born, *Erinnerungen von J. D. H. Temme* (Leipzig, 1882), and A. Lichtenstein, *Der Kriminalroman* (Munich, 1908).

TEM'PE (Lat., from Gk. Τέμπη). A narrow mountain defile, about four and a half miles long, in the northeastern part of Thessaly, between the precipitous sides of Mount Olympus (q.v.) and Ossa (q.v.), through which the river Peneus rushes to the Gulf of Saloniki. At places the rocky walls retire, leaving room for little glades and openings. Tempe was celebrated as one of the favorite haunts of Apollo. It was from the earliest times noted for its beauty and picturesqueness and was constantly praised in song. The name finally came to be applied to any beautiful and sequestered vale.

TEMPELTEY, tĕm'pel-tī, Eduard von (1832–). A German dramatist, born in Berlin. He studied at the University of Berlin, and subsequently took up journalism. In 1862 he entered the service of the Duke of Coburg. Among his other duties was the superintendence of the court theatre. He was the author of several dramas, popular in their day, among them *Clytemnestra* (1857) and *Cromwell* (1883).

TEM'PERA (It., from Lat. *temperare*, to proportion, modify), or Distemper. In its original sense tempera signifies any fluid medium with which pigments may be mixed; but the term is usually restricted to a glutinous medium, such as egg, size, or gums, as distinguished from oil; and especially to that in which the yolk of eggs is the chief ingredient. Various mediums have been used, such as the juice of young sprouts of the fig tree, vinegar, and honey. Tempera differs from fresco in that the pigments are not applied to the fresh plaster, but to the dry surface; they may be applied to any kind of surface. When tempera paintings have been coated with an oil varnish for purposes of preservation, it is difficult to distinguish them from oils. They are usually clear and brilliant in color, precise in form and outline; the rapid drying of the color preventing any blending of color or outline.

Tempera is probably the most venerable kind of painting, having been used in ancient Egypt, Babylon, and Nineveh, and by the Greeks for interior decoration. It was the favorite medium throughout the Middle Ages, even for wall decoration. During the fourteenth and fifteenth centuries the increased technical skill led to the more frequent use of fresco, which had to be executed with great rapidity (see FRESCO); but tempera was used for the finishing touches. It continued to prevail for panel paintings until the perfection of the new oil medium by the Van Eycks (q.v.) displaced it in the north. In Italy its use lingered until about 1500, nearly all of the greatest paintings of the early Renaissance which are not frescoes being executed in this medium. In recent years tempera has been revived with some success, particularly since the publication and translation of Cennino Cennini's treatise, which embodied the methods used by the early Italians; in Germany by Baron von Pereira at Stuttgart, and in France by Vibert and others. In England the Tempera Society has held exhibitions since 1905. Consult: Pereira, *Leitfaden für de Temperamalerei* (Stuttgart, 1893); *The Book of the Art of Cennino Cennini* (Eng. trans., London, 1899); P. G. Hamerton, *Graphic Arts* (new ed., Boston, 1902); Friedlein, *Tempera und Temperatechnik* (Munich, 1906).

TEM'PERAMENT (Lat. *temperamentum*, due proportion, from *temperare*, to proportion, modify, from *tempus*, time, season). Emotional constitution, i.e., disposition towards a given type of emotional reaction. An individual's temperament is said, e.g., to be impulsive if he responds, as a rule, quickly and with feeling to situations; the temperament of the opposite type is said to be cold and sluggish. The usual classification of temperaments is that formulated by Galen: choleric (energetic, objective), sanguine (warm, impressionable, changeable), melancholic (sentimental and subjective), and phlegmatic (quiet, slow, and persistent). The manner in which these differ both in strength and in the rapidity of alteration in the affective reaction may be expressed as follows:

	Strong	*Weak*
Quick	Choleric	Sanguine
Slow	Melancholic	Phlegmatic

The word is used more widely to cover any general mental characteristic or aptitude; e.g., nervous or musical or artistic temperament.

Bibliography. Francis Galton, *Natural Inheritance* (New York, 1889); James Sully, *The Human Mind* (2 vols., ib., 1892); A. Fouillée, *Tempérament et caractère* (Paris, 1895); Hermann Lotze, *Microcosmus: An Essay Concerning Man and his Relation to the World;* Eng. trans. by Hamilton and Jones (4th ed., 2 vols., ib., 1897; 5th Ger. ed., 3 vols., Leipzig, 1888–1905); W. M. Wundt, *Physiologische Psychologie* (6th Ger. ed., Leipzig, 1908–11); O. Külpe, *Outlines of Psychology;* Eng. trans. by E. B. Titchener (new ed., London, 1909); N. Ach, *Ueber den Willensakt u. das Temperament* (Leipzig, 1910); E. Meumann, *Vorlesungen zur Einführung in der experimentelle Pädagogik*, vol. ii (ib., 1913); Joseph Jastrow, *Character and Temperament* (New York, 1915). See DISPOSITION; MENTAL CONSTITUTION; TENDENCY.

TEMPERAMENT. In music, a system of compromise in keyed instruments for the avoidance of the necessity presupposed by the strict relation of musical intervals of having a separate row of keys corresponding to each tonic. Taking C as keynote, the ratios of the notes of the diatonic scale, as derived from the number of vibrations in a given time of a string sounding that note, are:

C	D	E	F	G	A	B	C
24	27	30	32	36	40	45	48

The intervals between these notes are by no means equal, and may be thus expressed in numbers by logarithms:

$$\begin{array}{ccccccccccccccc} C & & D & & E & & F & & G & & A & & B & & C \\ & 51 & & 46 & & 28 & & 51 & & 46 & & 51 & & 28 & \end{array}$$

We have here three species of intervals, of which those represented by 51 are called major tones; those by 46, minor tones; and the smaller intervals represented by 28, semitones. These intervals will evidently only serve with C as keynote. If, e.g., we start from D instead of C, we find E a tolerable, though not quite correct, second to D; but the third and seventh of the scale are entirely wrong. Were the major and minor tones equal, and each semitone exactly half a tone, the insertion of a note in the middle of each tone dividing the seven intervals would make it immaterial where the scale began, any one of the 12 notes becoming alike available as a keynote; and though such equality is contrary to the immutable principles of harmony, an arrangement based on it is found practically to give but little offense to the ear. In what is called the equal temperament, the 12 intervals are all of the same length, and no advantage is given to one key over the rest. This is, in theory at least, the temperament adopted in the pianoforte. By means of this equal temperament it is possible to start from any tone of the scale and, going always by the interval of a fifth, arrive at the same tone six octaves above or below the starting tone. Acoustically, c^5 is 74–73 higher than the sixth octave of C. Instead, therefore, of using the acoustic fifth the tempered fifth is used, which makes b^4 identical with c^5. Hence the possibility of free modulation through all keys, which in recent times has led to the recognition of tonality (q.v.). As soon as the principle of equal temperament was understood the modern system of major and minor modes displaced the old church modes. Two of the most active champions of equal temperament were Rameau and J. S. Bach. The former was chiefly the theorist, the latter the practical composer. Bach's immortal *Wohltemperiertes Klavier* was written with the special purpose of introducing the new system of equal temperament. See COMMA.

TEMPERANCE (Lat. *temperantia*, moderation, sobriety, self-control, from *temperare*, to proportion, modify). Primarily, a moderate use and enjoyment of all good things. In modern days the word is often used to designate great moderation in the use of alcoholic beverages, or even total abstinence from them.

Among uncivilized races, ancient and modern, intoxication has been associated with religious ideas and has been encouraged as an incident of religious festivity. As a common vice of appetite it has always been condemned, and in almost all communities in one way or another punished. The earliest attempt at temperance reform is claimed by the Chinese, who affirm that in the eleventh century B.C. one of their emperors ordered all the vines in the Kingdom to be uprooted. Early reforms are attributed also to the priests of India and of Persia. The Carthaginians forbade wine in their camps, and to magistrates holding public office. Among the Hebrews there were sects and orders which abstained from intoxicants. The Buddhists taught total abstinence. The Christian Church made attempts to bring about a more moderate use of the wine cup. St. Gildas dealt out severe punishment to any churchman guilty of drunkenness. Dunstan is said to have labored in the cause of temperance in England to the end that King Edgar at his instance restricted the number of taverns and the quantity of intoxicants that might be sold. By a law of 1285 taverns in London were required to close at curfew. From 1603 legislation against alehouses and drunkenness increased. In 1736 Parliament attempted to restrict the use of gin by means of a prohibitory tax, which, however, only brought about an illicit trade.

United States. In April, 1808, a society was formed at Moreau, Saratoga Co., New York, with 43 members, which provided in its constitution that "no member should drink rum, gin, whisky, wine, or distilled spirits, . . . except by advice of a physician or in case of actual disease (also excepting at public dinners), under penalty of 25 cents; . . . provided that this article shall not infringe on any religious rites." This society existed for 14 years, but accomplished little. The American Temperance Society was founded in Boston, February, 1826, and the New York State Temperance Society in 1829. By 1830 the latter society numbered 100,000 members. In 1833 prominent members of Congress organized the Congressional Temperance Society. Before the Civil War many secret societies were established for the promotion of temperance. They required a pledge of total abstinence, advocated prohibition, and tried to educate public sentiment in favor of reform. They also provided the usual beneficiary features and opportunities for self-culture. The Sons of Temperance, founded in 1842, grew rapidly in membership and influence. (See TEMPERANCE, SONS OF.) The Independent Order of Good Templars was started in New York in 1851. It spread over the world. (See GOOD TEMPLARS, INTERNATIONAL ORDER OF.) The Templars of Honor and Temperance (1845) were strong in the South. Later benefit but nonsecret societies are the Royal Templars of Temperance (Buffalo, 1869), and the Templars of Temperance, an order strong in England and Scandinavian countries. After the Civil War consolidation of societies began. In 1865 the National Temperance Society and Publication House was organized at Saratoga, as a nonpartisan and nonsectarian society, advocating total abstinence. This society published and distributed pamphlets, textbooks, and papers, held public meetings, and called national and international conferences. The Women's Crusade led to the organization in 1874 of the Woman's Christian Temperance Union (q.v.). In 1868 a prohibition party was organized in Illinois and a temperance political party in Michigan. The call for a convention came from the Grand Lodge of Good Templars. The National Prohibition Party was organized in Chicago in September, 1869. (See PROHIBITION.) Law and Order Leagues were established to see that existing legislation is properly enforced (Chicago, 1872; New York, 1877; Philadelphia, 1880; Massachusetts, 1882). In 1883 the general society—the Citizens' Law and Order League of the United States—was formed.

Temperance sentiment developed rapidly. A number of temperance organizations were formed, important ones being the Lincoln Legion (1903), a total abstinence league, and the Loyal Temperance Legion, a temperance organization for juveniles. The Intercollegiate Prohibition Association (1901) has an enrolled membership of 8800. In 1914 the Secretary of the Navy issued an order which prohibited the introduction for drinking purposes of alcoholic liquors on board any naval vessel or within any navy yard or station. Most of the railroads have stopped serving liquor on their trains. Railroads and industrial concerns are refusing to hire men who drink. Such railroads as the Pennsylvania have rigid rules against the use of intoxicants at any time. Industries such as the American Car and Foundry Company, American Sheet and Tin Plate Company, and the Lukens Iron and Steel Company have prohibited the use of liquor among employees. The Antisaloon League of America celebrated its twentieth anniversary in 1913. Law and Order Leagues have been formed in many States to assist in enforcing prohibition legislation. The Catholic Total Abstinence Union of America has about 100,000 members.

Great Britain. In August, 1829, a temperance society was started at New Ross, County of Wexford, Ireland, whose members pledged themselves to abstain from liquors, except as medicine. At the same time a similar movement began in the north of Ireland. Within 12 months there were 60 societies, with 3500 members. The Glasgow and West of Scotland Temperance Society was founded in November. Up to this time moderate use of liquor was permitted, but John Dairé and others of the Society of Dunfermline pledged themselves to total abstinence and began to form total abstinence societies. The first societies in England were at Bradford, Warrington, and Manchester in 1830. The British and Foreign Temperance Society, founded in London (June, 1831), through the influence of William Collins of Glasgow, was for some years the leading temperance society in England. It was the first to start a crusade against beer. The movement for total abstinence had its beginning at Preston in Lancashire. After the formation of the Youth's Temperance Society at Preston in 1834, and its extension to other forms, a conference was held at Manchester, resulting in the organization of the British Association for the Promotion of Temperance, on the Principle of Total Abstinence from all Intoxicating Liquors. Thereupon the total abstinence element struggled for recognition in the British and Foreign Temperance Society. In August, 1836, the teetotal society was merged into the New British and Foreign Society for the Suppression of Intemperance. The later periods of temperance work in Great Britain may be designated by: (1) the Father Mathew crusade in 1838, during which in two years 1,800,000 people took pledges in Ireland; (2) the beginning of work among children through the formation of Bands of Hope, in 1847; (3) the John B. Gough (q.v.) mission in 1858; (4) the introduction of Good Templarism, in 1868; and (5) the organization of the Blue Ribbon Army on Feb. 10, 1878, now the Blue Ribbon Gospel Temperance Movement with branch organizations, the Help Myself Societies for men and the Help One Another Societies for women. The United Kingdom Alliance (1853) urges prohibition upon Parliament.

Great Britain has a large number of important temperance societies. A few of the more important are: British Temperance Legion, United Kingdom Alliance, Army Temperance Association, Navy Temperance Association, Temperance Legislation League, Sons of Temperance, British Medical Temperance Association, British National Woman's Temperance Union, and World's Woman's Christian Temperance Union. A complete list of the important temperance associations is given in Hazell's *Annual*, 1915.

The temperance movement in America and Great Britain has been characterized by the emotionalism of religious revivals. Prayer and conversion were offered as aids to reform. Many religious organizations as such have interested themselves in temperance work. The Methodist church from the days of the Wesleys has advocated total abstinence. The Friends were opposed to drinking, and among the Dunkards abstinence was a test of fellowship. Since the beginning of the nineteenth century, Baptists, Congregationalists, and Presbyterians have been opposed to drinking. Among the general church organizations are: The Congregational Total Abstinence Association (1874); The Baptist Total Abstinence Association (1874); the Total Abstinence Society of the Presbyterian Church of England (1892); a number among various Methodist sects; Church of England Temperance Society (1862, reorganized 1873), formed to promote temperance, to study the causes of the abuse of alcohol, and to do rescue work. The Roman Catholic church advises moderation, but where this is impossible, total abstinence. The International Antialcohol Congress has been held biennially for 20 years. In 1913 at Paris was held the first meeting of the International Committee for the Study of the Liquor Question.

Medical men have formed societies, such as the British Medical Temperance Association, (1872) advocating total abstinence and making investigations, and the American Medical Temperance Association (1891). Some labor unions, especially the Knights of Labor, have discouraged the use of intoxicants. Farmers' associations, such as the National Farmers' Alliance and the National Grange, have put themselves on record as opposed to the liquor traffic. Among the many children's societies that have been organized are: the Cold-Water Army (1828); juvenile branches or cadets of secret societies; Bands of Hope; and the Loyal Temperance Legions of the W. C. T. U. In opposition to temperance reformers, liquor manufacturers and dealers have organized to prevent hostile legislation. In 1862 the United States Brewers' Association was formed to oppose the internal revenue taxes and prohibition. In Illinois the brewers organized, purchased saloon sites in Chicago, and established cheap saloons conducted by agents. The Liquor Dealers' and Manufacturers' State Protection Association of Illinois is another association of liquor men.

In August, 1846, a World's Temperance Congress was held in London, at which 302 delegates were present. Since then there have been other international conventions, notably the World's Temperance Congress of 1893 at Chicago. At this meeting the economic aspects of the problem, especially the cost to the workingman, were emphasized. There was a general feeling in favor of total abstinence among English and Americans, while the Europeans advocated moderation and the drinking of wine. In Australia the movement has progressed along the same line as in England and America.

Canada. Various societies, including the Independent Order of Good Templars, Sons of Temperance, Dominion Prohibition Alliance and its provincial branches, Women's Christian Temperance Union, Royal Templars of Temperance, and other similar organizations did much to mold Canadian public opinion in favor of temperance and prohibition. In 1864, three years before confederation, the Dunkin Act provided for local option in the townships and smaller municipalities of Ontario and Quebec. In 1878 the Canada Temperance Act, commonly known as the Scott Act, enlarged the scope of local option by providing for prohibition in entire counties, many of which adopted it. Ten years later a reaction against this law caused its repeal in numerous cases, and this was followed by attempts at Dominion and provincial prohibitory legislation. Public opinion was sounded by plebiscites, but the majorities were not large enough to warrant legislation. A majority of the provinces then enacted local option laws, but about 1912 a renewed demand for provincial prohibitory laws made itself felt. In 1914–15 abolition of the bar was made a part of the Ontario Provincial Liberal platform, and 77.3 per cent of the voters favored it in 1916. In the same year nine-tenths of Nova Scotia was under prohibition by local option. In Quebec Province the same held true of 480 municipalities, but compensation is provided for liquor license holders in Quebec and Montreal whose licenses were annulled by statute. The Province of Saskatchewan in 1915 abolished the bar, placed all liquor stores under local option laws, and forbade them to be kept in connection with hotels. Manitoba passed a prohibitory law in 1916. Prohibition was in force in 1916 in Prince Edward Island. Prohibitory restrictions on account of the Great War were applied in the various provinces for the protection of the troops and to aid recruiting.

Scandinavian Countries. Drunkenness has been a serious vice in Sweden and Norway. Various temperance societies have been organized, and the efforts to solve the question by means of the Bergen system of monopoly in Norway and the Gothenburg system (q.v.) in Sweden have received much comment. Under a system of local option half the towns of Norway have prohibited the sale of alcoholic liquors. Iceland adopted prohibition in 1908.

Germany. The German Temperance Society was organized in 1837, but the national custom of beer drinking lessens the importance of the liquor problem in that country. As a war measure, in order to preserve barley for bread, the quantity of beer which could be brewed throughout the Empire was limited to 40 per cent of the average output; local authorities were given the power to limit or prohibit the sale of spirits; in certain areas spirits could not be sold to soldiers in uniform.

Austria. Only recently has a temperance movement been organized. The Society for Checking Inebriety was started in 1884. As a war measure the malting of corn was prohibited, the week-day hours for the sale of drink limited to from 9 A.M. to 5 P.M., and Sunday closing imposed where nothing but liquor was sold.

Belgium has several temperance societies, among them the Association against the Abuse of Alcohol (1878).

Switzerland has a total abstinence movement, superseding societies advocating moderation. The Blue Cross Federation was founded in 1877. In 1908 the importation of absinthe was prohibited.

Latin Countries. Spain, up to 1860, was a sober country. Since then a slight increase in drunkenness has been due to the adulteration of wines, which has caused the people to use spirits. There is no active temperance movement, however. Since the destruction of the vines has led the poor of France to drink adulterated spirits, drunkenness has increased, and there is a decided temperance movement in favor of moderation rather than total abstinence. The sale of absinthe was prohibited in 1914 as a war measure.

Russia. Drunkenness has been a great vice in Russia. The peasant drink vodka is particularly intoxicating. Various temperance societies exist. In 1914 the Russian government stopped the manufacture and sale of vodka, with remarkable results in increase of savings and improvement in public order.

General Considerations. 1. *Economic Aspects.*—A large amount of capital is invested in the liquor business—vast manufacturing plants (breweries and distilleries), and the property, fittings, and money paid for bonds and licenses necessary for the retail trade. In the United States from the 1909 census figures the number of distilleries was 613; total number of persons engaged in the distilling industry, 8328; average number of wage earners, 6430; capital invested, $72,450,336. The number of breweries was 1414; the total number of persons in the industry was 66,725; the average number of wage earners was 54,579; capital invested, $671,158,110. The number of vinous liquor establishments was 290; total number of persons in the industry was 2726; average number of wage earners, 1911; capital invested, $27,908,-487. The statistical abstract for 1913 shows the consumption of wines and liquors in the United States for the preceding year to be 2,233,420,461 gallons. The per capita consumption was 22.68 gallons. The internal revenue collections for the year ending June 30,. 1913, were: from spirits, $163,879,324.54; from fermented liquors, $66,266,989.60. New York City's receipts from liquor revenue for the year ending Sept. 30, 1915, were $11,743,240.87. The annual cost of liquor consumed by the people of New York City is more than $150,000,000. An important economic consideration for the community is the cost of maintaining criminals and paupers made so by the abuse of intoxicants.

2. *Relation to Poverty.*—Drunkenness makes greater ravages among artisans than among paupers. Warner's tables show that it was the direct cause of distress only in 15.28 per cent of the cases investigated. Drinking to excess is rather a symptom than a source of degeneration, and develops in a people of natural strength exhausted by vice, overwork, and conditions of life that undermine health.

3. *Legislative Aspects.*—Various attempts have been made to control the liquor traffic by legislation, while certain regulations have always been considered necessary. The national government, since 1789, has placed internal revenue taxes and some customs duties upon liquors. Congress also has passed laws regulating the sale of liquor to Indians and soldiers and the sale in the District of Columbia, and requiring the scientific study of temperance in the schools of the District of Columbia, military, Indian, and territorial schools. In the States the methods used to control the liquor traffic are: (1) licenses; (2) local option; (3) prohibition; (4) dispensary system. It has been customary from the earliest times to license the sale of liquor. The modern issue has been that of high license ($500 or more), which its advocates claim lessens the number of saloons and improves their character. High licenses prevail in large cities. Local option has the advantage of the support of public opinion. The earliest laws were those of Connecticut (1839) and New York (1845). In 1912 the ruling went into effect prohibiting the importation of absinthe into the United States. In 1913 the Isthmian Canal Commission refused to issue licenses to the 35 saloons that had existed in the Canal Zone. The Webb-Kenyon Law prohibits the shipment of liquor into territory in which its sale is forbidden by State or local laws. A prohibition amendment was submitted to Congress in 1913 but failed to receive the necessary two-thirds vote to have it submitted to the States for ratification. There are now 19 prohibition States and 19 having local option. Among the prohibition States is South Carolina which had been distinguished as the only State having the State Dispensary System. The States having prohibition are Alabama, Arizona, Arkansas, Colorado, Georgia, Idaho, Iowa, Kansas, Maine, Mississippi, North Carolina, North Dakota, Oklahoma, Oregon, South Carolina, Tennessee, Virginia, Washington, and West Virginia. In the States having county or municipal local option much of the territory is without the saloon.

Remedies. The arguments advanced against the use of alcoholic drinks have been: (1) Scriptural, based on a supposed distinction in the Bible between fermented and unfermented wine, as shown by the use of the Hebrew words *yayin* and *tirosh;* (2) physiological, which claims alcohol to be a poison and which shows that temperance conduces to health; (3) social, viewing alcohol as a cause of crime, vice, and poverty; and (4) economic, in that the manufacture and consumption of alcohol are nonproductive and a great waste of material. The remedies offered by the early temperance movement were reformatory and preventive. Moral suasion was used, and drinkers were urged to sign the pledge and to strengthen themselves by the aid of prayer and religion. Total abstinence was demanded of the strong to help the weak. Prohibition was urged in order to remove temptation. Homes and asylums were established, as the Washingtonian House in Chicago and the Franklin Home, Philadelphia. The prevention work was largely educational through the distribution of literature, lectures, the formation of societies, and the preparation of textbooks for use in the public schools. Business considerations now exert an important influence. In positions of responsibility or where accidents are likely (such as engineers, foremen, watchmen) drinking is prohibited. The habits of applicants for employment are carefully scrutinized, especially in the business of transportation. Even where moderation is overlooked, excess is never tolerated. Saloon property pays a higher insurance rate. Some life-insurance companies refuse to insure men engaged in the liquor business.

Important contributions to the study of the liquor problem have been made by the Committee of Fifty formed in 1893 and comprising representative men in the fields of education, religion, and sociology. The committee had its origin in a group of men who, beginning in 1889, had associated themselves for the purpose of pursuing the study of practical problems in sociology. Meetings are held twice a year in New York. Four subcommittees deal with the different aspects of the liquor problem, physiological, legislative, economic, and ethical.

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TEMPERANCE, Sons of. An order founded in New York in 1842 with the object of making the great temperance movement of that period permanent. It has life insurance, sick and funeral benefit features. There are male and female members and there is a cadet branch for boys of 16 years, who are known as the Cadets of Temperance, and who subscribe to a pledge which binds them to avoid all connection with the use, sale, or manufacture of spirituous liquors. There are five grand divisions of the order, one in England, where it was introduced in 1846, two in Australia, one in New Zealand, and one in North America. About one-half of the members are in the United States and it is estimated that 3,000,000 members have been on the rolls since the organization of the order. The membership in North America in 1916 was about 25,000, of which 12,000 were in the United States. The ritual is very impressive. The order is now established in Great Britain, Ireland, the Bahamas, Liberia, New Zealand, Australia, Scotland, and Wales.

TEMPERANCE LEAGUE, Loyal. See Loyal Temperance League.

TEMPERATURE. See Heat.

TEMPERATURE, Critical. See Critical Point.

TEMPERATURE, Terrestrial. The distribution of heat in the atmosphere depends to some extent on its direct absorption of solar radiations, and especially the absorption at the upper surface of the clouds, but is principally governed by the angular altitude of the sun and the contact of the air with the ground and the ocean. The marked irregularities of temperature give rise to the great currents of air as well as to the local winds, and the latter carry the heat rapidly from one part of the globe to the other, so that ultimately the atmospheric temperature is almost equally controlled by the winds on the one hand and the oceans, continents, rain, snow, and cloud on the other. The typical continental climates experience great diurnal and annual ranges of temperature, and the typical oceanic climates show a small range.

The distribution of temperature on any level surface at any depth below or height above sea level is shown by means of isotherms, which are drawn through all places that have the same temperature at any moment, or the same monthly or annual mean temperature. Charts showing these isotherms have been published by various meteorological services for the air and the land, and by various hydrographic offices for the oceans. The highest mean annual temperatures occur within the tropics and especially over the land areas of northern Africa and southern Asia, with corresponding small regions in Central America and the northern portion of South America. Abnormally high maximum temperatures occur in limited regions outside the tropics but are the result of peculiar topographic conditions. Thus Death Valley, Cal., experienced maximum temperatures of 120° to 134° in the years 1911 to 1915, the reading of 134° F. in July, 1914, being the highest known natural air temperature in the United States and probably in the world. (*Monthly Weather Review*, June, 1915, p. 278–280.) The lowest mean annual temperatures are found in northern Siberia and the northern portions of British America, which represent the southern extension of a large Arctic area of low temperature. See Climate.

TEMPERATURE OF THE BODY. The temperature in the healthy human adult averages from 98.4° to 98.6° F., but 97.5° and 99° F. are within normal limits. In the newborn child the temperature is slightly above the average, as it is in old age. Race has but a slight influence, a difference of 0.29° F. being observed between the nations of southern Europe and those of the northern part. The temperature rises slightly after a meal and during exercise. During the day the body heat varies about half a degree, being highest between 5 and 8 P.M., and lowest between 2 and 6 A.M. In childhood the temperature is easily and rapidly influenced, slight ailments causing marked febrile reaction. The temperature is registered by means of the clinical thermometer, which is self-registering, placed in the mouth, axilla, fold of the groin, the rectum, or the vagina. The surface of the body is slightly cooler than the interior. A temperature below 93° or above 108° F. is almost always fatal. The usual range in fevers is between 99.5° and 105° or 106° F. As a rule there is a constant relation between the amount of fever and the rapidity of the pulse (q.v.) in many people. A pulse of 80 indicates a temperature of 100° F.; a pulse of 90, a temperature of 101° F., etc. A rise of temperature between 99° and 102° F. is termed slight or moderate pyrexia; from 101° to 105° F. severe pyrexia; and above this point hyperpyrexia. Many chronic and a few acute diseases are characterized by a subnormal temperature. This is observed in hemorrhage, starvation, and wasting from chronic diseases. In the melancholia of certain mental troubles there may be great depression both of the general and surface heat. An elevation of temperature attends most acute and some chronic diseases. In the great class of the acute general infections (see NOSOLOGY) an elevation of the body heat is the most important symptom and is proportional to the severity of the disease. Very marked elevation of temperature (hyperpyrexia) is seen in tetanus, acute rheumatism, pernicious malarial fever, and after injuries to the spinal cord. In tetanus the thermometer may register as high as 112.5° F. In sunstroke or heat stroke, an equally high point has been reached. Lastly, the temperature may rise just before death, and after it, in *rigor mortis*. See ANIMAL HEAT; FEVER; ETC.

TEMPERATURE VARIETIES. Varieties, races, or subspecies are largely differentiated by variation resulting from being subjected to different influences, principally in the nature of temperature and comparative moisture. It is a matter of universal observation that widespread species present a great range of variability in size, proportion of parts, color, and other characteristics, so that it is often a matter of doubt whether a variant ought to be classed as a geographical subspecies, or as a distinct species. When it appears that the same kind of variation affects all or nearly all of the animals of a certain class in a region, coincidently with the character of the local climate, it is probable that the change from the normal noted is due to local climatic influence. Temperature seems to act most directly in producing the common form of seasonal dimorphism, which affects most of the higher animals that dwell in the temperate zones, and are called upon to endure winter cold as well as summer heat. This causes a semiannual change in mammals and birds from a comparatively thin and short coat of hair or feathers in warm weather to a thicker and longer covering more suitable to the cold. In addition, there is a greater or less change of color, the bright dress of summer, assumed after the spring molt, falling out in the autumn and being gradually succeeded by a plainer coloring for the winter months. The difference is often very great; and in the Arctic regions amounts to a change from decided colors in summer to pure white in winter.

The comparative degree of average moisture in the air of two regions will be reflected in the colors and other features of the same species of animals inhabiting them; those of the moist region will have darker colors, and a tendency to larger size and proportionally longer external parts, as bills, legs, and tails, than the dry land species, which will be more pale in color and compact in form. Dr. J. A. Allen has shown this very conclusively in his investigations upon North American birds, and C. W. Beebe has demonstrated it in his experiments on doves and other birds in the New York Zoölogical Park. Let one of two districts differing in average moisture be severed for a considerable period from the other and the results accredited to isolation (q.v.) would follow; but the species so formed might well be called temperature species in reference to their origin. Geographical races may therefore be regarded as incipient species.

That changes from heat to cold, wetness to dryness, or the reverse, in the climates of regions of the world in the course of its history since animal life appeared upon it, have been efficient factors in species making, may well be believed. See EVOLUTION; MELANISM; ISOLATION; and consult authorities there mentioned.

TEMPERING STEEL. Steel is hardened by heating to a cherry red which is slightly above its critical point (750° C.), and suddenly cooling. The hardness varies directly with the percentage of carbon and the rate of cooling. Steel quenched in water is very hard but is also brittle. It is therefore tempered by reheating to 200°–300° C., whereby the metal is toughened with some loss in hardness. If tempering be done in air and if the surface is free from oxide, the process can be followed by the temper colors which form on the surface, viz.: straw, 200° C.; golden yellow, 245° C.; brown, 265° C.; purple, 280° C.; blue, 290° C.; dark blue, 300° C. Thus a razor would be drawn to a straw color, while an axe requires a blue.

Tempering can be done in liquids such as oil, salt baths, molten lead, etc., the temperature being controlled by a thermometer or pyrometer, immersed in the bath.

Instead of hardening in water, the metal may be quenched in liquids which abstract the heat more slowly, as, e.g., oil or molten lead, the resulting metal being less hard but not so brittle. Steels of high carbon or intricate shape are liable to crack when water quenched and are usually hardened in oil, or molten lead (oil hardening, lead hardening), commonly spoken of as oil tempering and lead tempering. The word "temper" originally meant hardness (*trempé*, quenched) and we still use it to mean carbon content, e.g., die temper, 0.75 per cent; chisel temper, 1.0 per cent; razor temper, 1.4 per cent. See ANNEALING; IRON AND STEEL, METALLURGY OF; METALLOGRAPHY.

TEMPEST, MARIE SUSAN (1866–). An English actress, born in London of parents named Etherington. She received her early education at a convent in Belgium, and later studied music in Paris and London. Her first appearance on the stage was at the Comedy Theatre, London, in 1885, as Fiametta in *Boccaccio*. For some years she acted chiefly in musical plays, notably in *Dorothy* (931 times), but with her creation of the part of Nell Gwyn in *English Nell* (1900) and Becky Sharp (1901), she was recognized as one of the leading comediennes of the English stage, a position which she continued to hold. Some of her best-known parts were Polly Eccles in *Caste*, Peggy O'Mara in *All-of-a-Sudden Peggy*, Becky Warder in *The Truth*, and Kitty in *The Marriage of Kitty*. She visited America for the first time in 1890, playing Kitty Carroll in *The Red Hussar*, at Palmer's Theatre, New York, and thereafter was almost as well known in the United States as in England. In 1914 she appeared in New York in the title rôle of Henry Arthur Jones's comedy, *Mary Goes First*, a part in which she had already been successful in London; and in 1915 she revived *The Duke of Killiecrankie*, one of her former successes. Miss Tempest was sometimes her own manager. She was married in 1898 to Cosmo Gordon-Lennox.

TEMPEST, The. A play by Shakespeare, first acted in 1610, and first printed in the *Folio* of 1623. The sources are principally books of travel: Eden's *History of the Travaile* (1577), Raleigh's *Discovery of Guiana* (1596), and S. Jourdan's *Discovery of the Bermudas* (1690), telling of Sir George Somers's fleet at Bermuda in 1609.

TEMPES'TA. See Mulier, Pieter.

TEM'PLARS, Knights. A religious and military order of the Middle Ages, the great rival of the Knights of St. John of Jerusalem. In 1119 Hugues de Payens and Geoffrey de Saint-Adémar (Saint-Omer), with six companions, formed a military band to protect pilgrims in Palestine. They adopted a monastic rule, and took the name Knights of Christ. But as quarters were assigned to them in the palace at Jerusalem, known as Solomon's Temple, they soon were called Knights of the Temple, or Knights Templars (*milites templi*). In 1128 at the Council of Troyes a rule, inspired by St. Bernard, and closely following the Cistercian, was given them.

The order grew rapidly. At the end of the thirteenth century it had about 15,000 members, and in the middle of that century it is said to have owned 9000 castles and manors. It was free from all taxes and was under the jurisdiction of the Pope alone. As the order had to make regular transfers of supplies and money from Europe to Palestine, they developed an effective banking system. Their strong and well-manned temples were the safest places for depositing treasure and documents and for a time the Templars were the bankers of Europe. There were three ranks in the order, knights, chaplains, and servants. The knights, few in number, were the real Templars. They directed the affairs of the order; they alone could wear the white mantle with its red cross. At the head of the order was the grand master. The capital of the order was at Jerusalem till 1187, and then successively at Antioch, Acre, and Cæsarea, and after the extinction of the Christian power in Syria (1291), in Cyprus. Their standard, called *Beauséant*, was half black, half white, with the motto *Non nobis Domine*. The Templars' wealth, pride, and power brought them into conflict with Church and State. With the decay of the crusading spirit their activity was feared, and in the latter half of the thirteenth century opposition grew. They had made enemies in other military orders and among the monastic orders. Their adoption of Oriental customs and the secrecy of their rites impressed popular imagination. They were charged with evil and sacrilegious practices. The direct attack on them came in France. Philip IV, under the influence of Guillaume de Nogaret, saw his chance to be rid of an insubordinate order, and to increase his wealth. He got Pope Clement V to aid him. On Oct. 13, 1307, the grand master, Jacques de Molay (q.v.), and many other Templars, were arrested without warning. Their trial was in charge of the Inquisitor for France. Most of them under torture confessed to some or all of the charges against the order. Many afterward retracted, including Molay. A large number were burned at the stake, Molay being spared for a number of years. In 1311 Clement called the General Council of Vienne, chiefly for the purpose of suppressing the order. When the council persisted in demanding that the question should be tried strictly as a judicial question without any regard for policy, Clement held a secret consistory, March 22, 1312, at which the suppression was decreed. On April 3 the bull *Vox in excelso* was published declaring the reasons for the papal condemnation. On May 2 the bull *Ad providam* was issued decreeing the final abolition of the order. Its property went to the Hospitalers; but the seizures of Philip were confirmed to him. Jacques de Molay was burned in 1314.

Consult: Henri de Curzon, *La règle du temple* (Paris, 1886); Julius Gmelin, *Schuld oder Unschuld des Tempelordens* (Stuttgart, 1893); H. C. Lea, *History of the Inquisition*, vol. iii (new ed., New York, 1906); Heinrich Finke, *Papsttum und Untergang des Tempelordens*, vol. i (Münster, 1907); Marquis d'Albon, *Cartulaire générale de l'ordre de Temple*, vol. i (Paris, 1913).

TEMPLE. A building consecrated to religious worship, especially among pagan peoples. The term is also applied to the chief sanctuary of the Jews (see Temple at Jerusalem), to Christian churches belonging to the Knights Templars, and in France to Protestant places of worship. It is also applied to the meeting places of certain Masonic bodies, and to buildings having the form or character of an antique temple. A temple was usually dedicated to some deity, whose image it contained; the interior was accessible to priests, but not to the general body of worshipers. Among most ancient peoples the temple was the principal architectural feature, as in Greece, where the history of temple construction is practically the history of architecture. The subject is therefore best treated under the general title Architecture, and in the subdivision *Architecture* in such articles as Assyrian, Babylonian, Chinese, Egyptian, Greek, Indian, Japanese, and Roman Art; also under Architecture, Ancient American; and Baalbek. In general, it may be observed that the ancient temples (excepting those of Chaldæa-Assyria) had these elements in common: a sanctuary containing the effigy or some other sacred symbol of the deity or deities worshiped; colonnades to shelter worshipers outside the sanctuary; one or more courts or inclosures with important gateways; and sometimes such adjuncts as a lake, grove, fountain, or well sacred to the deity. The Pantheon (q.v.) at Rome was dedicated "to all the gods." Temples of fame are a modern product; such are the Walhalla (q.v.) near Ratisbon, the Ruhmeshalle at Munich, and the Temple of Fame of the University of New York, which is really an open colonnade. See Hall of Fame for Great Americans.

TEMPLE. A city in Bell Co., Tex., 35 miles south by west of Waco; on the Gulf, Colorado, and Santa Fe and the Missouri, Kansas, and Texas railroads (Map: Texas, D 4). It has a Carnegie library, Temple Sanitarium, King's Daughters' Hospital, and the Gulf, Colorado, and Santa Fe Railroad Hospital. Cottonseed-oil mills, cotton gins and compresses, foundries and machine shops, bottling works, a large cold-storage plant, flouring mill, and a candy and chewing-gum factory are among the leading industrial establishments. The Gulf, Colorado, and Santa Fe Railroad maintains shops here. Pop., 1900, 7065; 1910, 10,993; 1915 (U. S. est.), 13,104.

TEMPLE, Baron Mount-. See Mount-Temple, Baron.

TEMPLE, Frederick (1821–1902). Archbishop of Canterbury, born at Leukas, in the Ionian Islands, and educated at Balliol College, Oxford. He was principal of Kneller Hall, and then inspector of church training colleges, until he was elected head master of Rugby, where his administration was very successful. In 1860 his name was prominent as one of the authors of *Essays and Reviews*, a book supposed to have a rationalizing tendency, though Temple's own essay on "Education of the World" contained little that would be considered dangerous nowadays. The suspicion of heterodoxy clung about him and found expression, when Gladstone in 1869 nominated him as Bishop of Exeter, in a formal protest against his confirmation. This distrust died away, and he acquired a reputation for absolute justice and impartiality, while in many respects his later career associated him rather with the High Church party than with the Broad. In 1885 he was transferred to the see of London, and in 1896 became Archbishop of Canterbury, and a year afterward stood out as a champion of the Church of England in a learned and dignified reply to the papal decision declaring the invalidity of Anglican ordination. He officiated at the coronation of Edward VII. His most important published work is *The Relation between Science and Religion* (1884). Consult: C. H. Dant, *Archbishop Temple* (London, 1903); F. J. Snell, *Early Associations of Archbishop Temple* (New York, 1905); *Memoirs of Archbishop Temple by Seven Friends*, edited by E. G. Sandford (2 vols., ib., 1906); H. C. Potter, *Reminiscences of Bishops and Archbishops* (ib., 1906).

TEMPLE, Henry John, third Viscount Palmerston. See Palmerston.

TEMPLE, Sir Richard (1826–1902). An English politician and author, born at Kempsey, near Worcester, and educated at Rugby. Having entered the Indian service in 1847, he rose quickly, becoming Finance Minister of India (1868), Lieutenant Governor of Bengal (1874), and Governor of Bombay (1877–80). On his return to England in 1880 he became financial member of the London School Board (1886–94) and president of the Social Science Congress. From 1885 to 1895 he sat in Parliament as a Conservative. For his services he was made Baronet in 1876. His publications include: *India in 1880* (1881); *Men and Events of my Time in India* (1882); *Oriental Experience* (1883); *Cosmopolitan Essays* (1886); *Palestine Illustrated* (1888); *Memoir of John Lawrence* (1889); *Story of my Life* (1896); *A Bird's-Eye View of Picturesque India* (1898); and *Letters and Character Sketches from the House of Commons, 1886–87* (published posthumously in 1912).

TEMPLE, Richard Temple Grenville, Earl (1711–79). An English statesman. He was the eldest son of Richard Grenville of Wotton Hall, Buckinghamshire, and was educated at Eton and privately. In 1734 he was returned to Parliament for Buckingham. On the death of Viscount Cobham in 1749 his mother was created Countess Temple and upon her death in 1752 Grenville succeeded to the Temple earldom. He was a political associate of William Pitt, who married Grenville's sister Hester, and he held the position of First Lord of the Admiralty, 1756–57, and Lord Privy Seal, 1757–61. He was afterward in frequent opposition to the King and was a violent promoter of factions. Consult the *Grenville Papers* (1852–53), which consist of the correspondence between Pitt and George and Richard Temple and throw much light on the political and court life of the period.

TEMPLE, The. 1. A former stronghold of the Templars in Paris, built in 1212. When the order was suppressed in 1312 it was used as a royal treasury and subsequently as a prison. During 1792 and 1793 Louis XVI and his family were confined in it. The last remains of the building were removed in 1871 and its site is now occupied by the Marché du Temple. 2. A former lodge of the Templars in London, dating from the end of the twelfth century, and now represented by Temple Church (q.v.) and the Inns of Court, known as the Inner and Middle Temple, which stand on the site of the ancient building, the former within the precincts of the city. The Temple became crown property when the order was dissolved, was presented to the Earl of Pembroke, and then passed to the Knights of St. John, who leased it to law students.

TEMPLE, Sir William (1628–99). An English statesman and essayist, born in London. He was reared by an uncle, Dr. Henry Hammond, rector of Penshurst, in Kent. He entered Emmanuel College, Cambridge, in 1644; but he left four years later without a degree, and set out for France. On this journey he met Dorothy Osborne (q.v.). In 1665 Temple was sent to Westphalia on a secret mission to the Prince Bishop of Münster. On his return (1666) he was created Baronet, and appointed Resident at the court of Brussels. His most important diplomatic success was the famous treaty of 1668, known as the Triple Alliance, by which England, Holland, and Sweden bound themselves to unite in curbing the ambition of France. Temple was long Ambassador at The Hague and helped to bring about the marriage of the Prince of Orange with the Princess Mary (1677). In 1679 Charles II urged him to become his Secretary of State. Though Temple refused this post, he attempted to reform the government by establishing a privy council of 30 members, by whom the King promised to be guided in all public affairs, but this council proved an utter failure. Temple soon abandoned politics and retired, first to Sheen, and then to Moor Park in Surrey, where for the last 10 years of his life he devoted himself to landscape gardening and to literature. During this period he received into his household as amanuensis, and afterward as secretary, Jonathan Swift (q.v.), who ultimately became his literary executor.

As a writer Temple is now known chiefly by his historical *Memoirs* (unauthorized ed., 1691; 1709) and his *Miscellanea* (1680; 1692). In the series of 1692 first appeared the famous essay on "Ancient and Modern Learning," which deals with the comparative merits of ancient and modern literature. The outcome of the spirited controversy in England was Swift's *Battle of the Books* (1704). (See BATTLE OF THE BOOKS.) Temple has been considered one of the reformers of English style. According to Dr. Johnson he was the first writer to give cadence to English prose. During the eighteenth century Temple's essays were regarded as models; his English was particularly pleasing to Charles Lamb, who comments upon it in his "Essay on the Genteel Style." Consult: his *Life and Works* (4 vols., London, 1814), including the *Letters;* T. P. Courtenay, *Memoirs . . . of Sir William Temple* (2 vols., ib., 1836); Macaulay's article on this biography in the *Edinburgh Review* for October, 1838 (reprinted in *Essays*); M. L. R. Beaven, *Sir William Temple*, Gladstone essay, 1908 (Oxford, 1908); E. S. Lyttel, *Sir William Temple*, Stanhope essay, 1908 (ib., 1908); *Letters from Dorothy Osborne to Sir William Temple*, edited by E. A. Parry, in "The Wayfarer's Library" (New York, 1915).

TEMPLE AT JERUSALEM. The sanctuary erected by Solomon (c.993–953 B.C.) on the eastern hill, between the Tyropæon and Kidron valleys, north of the original city of David on the Ophel hill, and opposite the Mount of Olives. According to 2 Chron. iii. 1 it was built on the threshing floor which David had purchased from Ornan (elsewhere Araunah and Ornajah, perhaps originally Adonijah), the Jebusite. Here the angel ceased smiting Israel, indicating that it was a sacred place. Probably this sanctity already adhered to it in the Amarna period (c.1400 B.C.). The construction of Solomon's temple was begun c.990 B.C. and seven years later it was dedicated. It was made possible by the friendly relations between Solomon and Hiram of Tyre, who furnished skilled workmen as well as cedars and firs from the Lebanon. In the account (1 Kings vi, somewhat expanded in 2 Chron. iii–iv) of the building certain features of the design are clearly set forth, others are wholly passed over, so that efforts to restore it from these descriptions have produced an extraordinary variety of results. The references to earlier sanctuaries at Shechem, Ophrah, Dan, and Shiloh are too meagre to be of any assistance, and the description of the tabernacle in Ex. xxv. ff. is regarded by most modern scholars as a projection into the past of the Solomonic temple itself, and an idealization of the humbler tent which actually had sheltered the palladium of Israel. The temple proper of Solomon measured 60 cubits in length, the outer sanctuary or holy place being 20 by 40 cubits in size and the holy of holies 20 by 20 cubits; both were 20 cubits high. Within the latter was the Ark of the Covenant under two cherubim (see CHERUB) with outspread wings; in the holy place were the altar of incense, the shewbread table, the seven-branched candlestick, and 10 smaller tables and candlesticks. Both chambers were wainscoted with cedar and wholly covered with gilding; they were separated by a veil or fixed curtain fitted with an olivewood doorway and doors. It was this veil that is said to have been "rent in twain" at the crucifixion (Matt. xxviii. 51; Mark xv. 38; Luke xxiii. 44). The golden candlestick carried by Titus to Rome in 70 A.D. is figured in a relief on the Arch of Titus.

In front of the temple porch were two columns of bronze, Jachin and Boaz, 23 cubits high; and against its side and end walls were three stories of small chambers for the priests. The court immediately surrounding the temple was reserved for the priests, and contained the brazen altar of burnt offering and the great bronze sea, or tank, borne on 12 bronze oxen; these, with the cherubim in the holy of holies, being the only examples of free sculpture in Jewish art. A second court was the place of general assembly for all Jewish worshipers; it preceded or surrounded the first; but whether built by Solomon or encircled at a later date is not certain. Solomon's palace and the House of the Cedars of Lebanon adjoined the temple court. Dependencies and outbuildings were added at various times to the main group. Of the architectural style of the temple little is known; but its builders were chiefly Phœnicians, and the combination of an Egyptian type of plan with such Assyrian decorative details as palms, cherubim, and knops and flowers is quite in harmony with the mixed style of Phœnician work in general. Hittite motives have also been suggested.

Solomon's temple was destroyed by Nebuchadnezzar in 586 B.C. Encouraged by the prophets Haggai and Zechariah, Zerubbabel, the Persian governor, himself a descendant of the old Davidic family, rebuilt the temple, which was finished in 516 B.C., with the permission of Darius Hystaspis. The temple proper was a reproduction of the original edifice, but far inferior to it in splendor of ornament and gilding. This second temple was desecrated by Antiochus IV Epiphanes and dedicated to Zeus Olympius in 168 B.C., but rededicated again to Yahwe in 165 B.C. Both the first and second edifices, were, however, surpassed in architectural splendor by the third temple which Herod began to erect in 20 B.C. and which was completed in 64 A.D. The area of the temple terrace was greatly enlarged by new substructures built with masonry of colossal magnitude, a section of which forms the present place of wailing of the Jews. Marble was profusely used for colonnades, gates, and walls, and the magnificence of Roman carved decoration and architectural detail was blended with the Oriental arrangement of the plan, which reproduced essentially the disposition of the two preceding structures, but with an additional exterior court of the Gentiles. A three-aisled portico of vast dimensions occupied the south side of the inclosure; Solomon's porch was reërected in the form of a colonnade along the east front, in which was perhaps the Gate Beautiful (Acts iii. 2). This temple, from which Jesus expelled the money changers and merchants, was destroyed during the pillage of the city by Titus, 70 A.D., but contrary to his orders. After the insurrection of Simon Bar-Kokba (q.v.) had been quelled, an altar or shrine seems to have been erected in its place to Jupiter Capitolinus by Hadrian, in front of which there were two statues of the Emperor, one at least equestrian. Neither Constantine nor his mother Helena appears to have paid any attention to these structures. Julian gave a permission to the Jews to rebuild their temple, but his brief reign did not allow this project to be carried out. On the temple area, called by the Arabs *Haram el sherif*, Abd el Melek, who reigned from 685 to 705, erected a splendid mosque, the *Kubbet el Ṣakhrah*, or Dome of the Rock, commonly known as the Mosque of Omar. Except for two intervals in the period of the Crusades the place has since remained in the hands of the Moslems.

All three temples must have presented an aspect of mixed architectural styles, due to the general lack of skill in the plastic arts among the Jews, and their consequent dependence on the arts of neighboring nations. Solomon's temple was, under these circumstances, a respectable achievement; though of course not to be compared with the great temples of Egypt or Babylonia; but it was far surpassed in scale and in magnificence of external architecture by Herod's temple.

The Temple Service. The Solomonic temple was primarily intended to be a Yahwe sanctuary, as is evident from 1 Kings viii. 13. But during the period of the Davidic dynasty many other divinities were worshiped in it. (See, e.g., Ezek. viii., 2 Kings xviii., xx.) The temple of Zerubbabel appears to have been devoted solely to Yahwe. In 168 B.C. the sanctuary was dedicated to Zeus Olympius and remained a Zeus temple for three years (1 Macc. i. 54; iv. 52). The magnificent temple of Herod was until the fall of Jerusalem the great centre of the Jewish sacrificial cult, having no rival except Onias's temple (q.v.) at Leontopolis, and was devoted exclusively to the imageless worship of Yahwe.

In the regal period the King was the chief priest officiating in the temple. Whether there was a ceremony corresponding to the seizing of the hands of Bel by the Babylonian kings, cannot be determined. But the annual entrance into the holy of holies by the high priest of the Persian period may have developed out of such a custom. David set the example of appointing his own sons as priests (2 Sam. xviii. 8). There was no distinction yet between priests and Levites. Even in the Deuteronomic code, introduced about 620 B.C., the Levites are priests whose function it is to offer sacrifices. In the Persian period a high priest was at the head of the hierarchy; and only families claiming descent from Aaron were permitted to offer sacrifices. The Levites were a class by themselves and were not allowed to present the sacrifices, while musicians and doorkeepers formed a still lower class. The Levites as well as the priests were divided into 24 courses. Next to the high priest ranked the Segan, or captain of the temple police, then came the heads of the 24 courses, and a large number of other officials. While in earlier times even the common people seem to have had access to the inner court, in later times the Levites and lower ministers were forbidden to enter it. Non-Israelites were not permitted to enter any part of the temple, but representatives of the people of Israel were required to attend in turn the daily offerings in the outer court.

The Tamid, or the daily offering, presented every morning and evening, was the most important of the many sacrifices of a public character. The number of sacrifices was increased on Sabbaths and festivals. The ceremony was preceded by lustrations and solemn choice of officiating priests. It consisted of the slaughter of the victim, the sprinkling of the blood on the altar, the removing of the blood from the altar of incense in the holy place, the trimming of the lamps on the candlesticks, the carrying of the different parts of the victim to the foot of the altar, the presentation of the flour offering, the baked meal, and the libations of wine. During the celebration of this sacrificial service, the Shema Israel (Deut. vi. 4–9; xi. 13–21; and Num. xv. 37–41), the Ten Commandments, and three blessings were pronounced by the priests. The offering of incense was accompanied with prayer. Then the Levitic choir, to the accompaniment of stringed instruments, sang the psalm of the day, divided into three sections. At the end of each, priests blew three blasts on the silver trumpets, and the people prostrated themselves. This ritual goes back at least to Hasmonæan times, and the music and singing no doubt formed a part of the daily service long before sections of the present Psalter were in use. After the public sacrifice, private sacrifices began.

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TEMPLE BAR. A noted gateway between Fleet Street and the Strand, London, built in 1670 by Wren, and marking the boundary of the city. Here the sovereign, on entering the city, was obliged to ask from the Lord Mayor permission to pass. The structure was removed in 1878 to make a way for the enormous traffic and its place was supplied by the memorial bearing statues of Queen Victoria and of Edward VII, then Prince of Wales.

TEMPLE CHURCH. The church connected with the former house of the Knights Templars in London, and the only portion of the original group of buildings remaining. It consists of a Norman round church, 58 feet in diameter, dating from 1185, with a choir added in 1240. It has a richly painted ceiling and interesting tiled flooring, and contains nine monuments of Templars. See Temple, The.

TEMPLER UND JÜDIN, tĕm′plẽr ụnt yụ′dĭn (Ger., Templar and Jewess). An opera by Marschner (q.v.), first produced at Leipzig, Dec. 22, 1829.

TEMPLE SOCIETY. See Friends of the Temple.

TEM′PLETON. A town in Worcester Co., Mass., 15 miles west by south of Fitchburg, on the Boston and Albany Railroad (Map: Massachusetts, C 2). Noteworthy features are the

Templeton Inn, State School for the Feeble Minded, Hospital Cottages for Crippled Children, and the Boynton Public Library. There are manufactories of chairs, baby carriages, playground apparatus, and post-office furniture. Pop., 1900, 3489; 1910, 3756. Templeton constituted part of the grant given the survivors of King Philip's War (see PHILIP, KING), and was once known as Narragansett Number Six.

TEMPLE UNIVERSITY. An institution founded in Philadelphia in 1888. It had its beginning in the desire to provide opportunities for study to ambitious young men who were obliged to study at night. Two years after its founding the increase in the number of students necessitated the removal to a separate building. In 1891 the power to confer degrees was conferred upon the institution, and in the autumn of the same year a day department was opened. On Dec. 12, 1907, the charter was amended, changing the name of the college from Temple College to Temple University. The Theological School was formed in 1893, the Law School in 1895, the Medical School in 1901, and in 1907 the Philadelphia Medical College was federated with the university. In 1916 there were 18 departments with 66 different courses offered to the students. The university conducts classes morning, afternoon, and evening during the academic year. The courses include those from kindergarten grades up to the highest university grades. These are given to the young people of the city for a normal fee, and with hours convenient to those who are employed either day or night. The university is nonsectarian, but is kept under a strong moral and religious influence. The total attendance in all departments of the university in 1915 was 3579. Of these 987 were in the Department of Commercial Education, 606 in the College of Liberal Arts and Sciences, 182 in the Department of Theology, 243 in the Department of Elementary Education, and 511 in the Preparatory Department. The remainder were divided among the other courses. The faculty numbered 290. The library contains about 9200 volumes. The university has no endowment. The college grounds and buildings are valued at about $565,000. The annual income is about $150,000. The president in 1916 was Russell H. Conwell, D.D., LL.D.

TEM'PO (It., time). The degree of rapidity with which a piece of music is to be executed. The rhythmical proportions of notes, as indicated by their form, give them only a relative value, and have no reference to the absolute speed at which the entire composition is to be played. The varying rates of speed at which different compositions or their divisions are to be played are usually indicated by certain terms called *tempo marks*. These terms are not always used with exact precision, and sometimes apply more to the character than to the absolute speed of performance. The following are the most common terms, in the order of increasing speed: *Grave, Lento, Largo, Adagio* (slow); *Andante, Moderato, Allegretto* (moderate); *Allegro, Vivo* (*vivace*), *Presto* (fast). Gradual increase in speed is indicated by *accelerando, stringendo;* gradual decrease by *rallentando, ritardando.*

The tempo is indicated with far greater exactness by references to the beats of the metronome (q.v.). It is not, however, uncommon for composers to express the tempo by reference to some well-known musical form which has a characteristic movement, as tempo di marcia, tempo di valse, tempo di minuetto, etc. Schumann and Wagner discarded the Italian nomenclature and indicated the tempo by means of German terms. In this they have been followed by a few other composers, but the German terms are not well enough known to be free from a certain vagueness. The Italian terms came into use at the beginning of the seventeenth century. Before that, the means of expressing the general speed at which a composition was to be played were very limited. In mensurable music (q.v.) each note had a certain average time value (integer valor); but in the course of years the unit of measure changed so frequently that great confusion ensued. In transcribing works of the sixteenth century in modern notation all notes must usually be reduced to about half their face values; in still older works the reduction should be to a quarter or an eighth of the original value. *Tempo rubato* (stolen time) characterizes a performance to which a restless movement is imparted by protracting one note beyond its proper duration, and curtailing another so that the aggregate duration of each measure remains unchanged. *Modification of tempo* is a term first used by Richard Wagner, in his article "Ueber das Dirigieren," to indicate that a composition cannot be played throughout in strict metronome time. This is especially true in dramatic music, and throws the responsibility for interpretation upon the conductor (q.v.). For detailed information regarding the above Italian terms, see the separate articles. See RUBATO, TEMPO.

TEM'PORALISM. In philosophy a term coined to designate a philosophic system which lays emphasis on the fundamental character of time in the constitution of the universe, as opposed to the philosophies which slur over or deny the validity of time, such as the philosophies of Spinoza and the Hegelians. William James, H. Bergson, and A. O. Lovejoy in recent philosophy are uncomprising temporalists. Consult Lovejoy, "The Problem of Time in Recent French Philosophy," in *Philosophical Review* (Boston, 1912). See TIME.

TEMPORAL POWER (Lat. *temporalis*, relating to time) OF THE POPE. The sovereign power which the Pope possessed as ruler of the Papal States (q.v.), which, although modified in its exercise by his spiritual character, was in substance the same as that of any arbitrary sovereign. Many of the mediæval sectaries held the incompatibility of the spiritual with the temporal power in the same person, not only in relation to the Pope, but also as to the other ecclesiastics who were feudal lords. Such were the doctrines of the Vaudois, of Pierre de Bruys, and above all of Arnold of Brescia (qq.v.). Through the centuries which followed, the antipapal controversies turned so entirely upon doctrine that there was little room for the discussion of this question, and it is a mistake to suppose that it entered into the conflict of Gallican and Ultramontane principles. Even the great Gallican champion Bossuet (q.v.) not only admitted the lawfulness of temporal sovereignty, but contended that it was in some sense necessary to the free exercise of his spiritual power, and to the independence of his ecclesiastical government. It was not until the aggression of the French Republic upon Rome, and the annexation of the papal provinces called the legations to the Cisalpine Republic, and afterward to the Kingdom of Italy, by Bonaparte, that the controversy assumed practical interest. For a few years all of the papal territories were in the hands of Napoleon. More recently, upon the incorporation of the whole of the Papal States in the Kingdom of Italy, the question once more agitated the Catholic world, and is still a practical one. Most Roman Catholics, while admitting that the possession of temporal sovereignty is no essential part of the privileges of the successor of St. Peter, regard the possession of a sovereignty independent of any particular sovereign as the means providentially established for the protection of the spiritual independence of the Pope, and of the free exercise of his functions as spiritual ruler of the Church.

TEMRYUK, tyĕm-ryo͞ok′. A seaport in the Province of Kuban, Ciscaucasia, Russia, on an inlet of the Sea of Azov, 90 miles west of Yekaterinodar (Map: Russia, E 5). It has an extensive export trade in grain and flour. Pop., 1910, 17,731.

TEMUCO, tȧ-mo͞o′kō. The capital town of the Province of Cautín, Chile, 140 miles southeast of the port of Concepción, with which it has railway communication, on the north bank of the river Imperial or Cautín (Map: Chile, E 5). The town has tanneries and breweries and carries on an important trade with the Araucanians of the vicinity. Pop., 1910, 16,037.

TEN, COUNCIL OF. See COUNCIL OF TEN.

TENAFLY, tĕn′ȧ-flī. A borough in Bergen Co., N. J., 16 miles north of New York City, on the Erie Railroad (Map: New Jersey, E 2). It contains the Mary Fisher Home for the Aged, the Rethmore Home for Children, and the Happy Land Home for Children. Tenafly is essentially a residential place, but has manufactures of shades and decorative cloths. Pop., 1900, 1746; 1910, 2756; 1915 (State census), 3050.

TENAILLE, tē-nāl′. In fortification, a low work situated in the reëntering angle formed in the enceinte ditch by the curtain and flanks of the bastioned system. It is isolated from these parts of the enceinte by a ditch, and is designed to serve as a mask, protecting the scarp walls of this reëntering angle from fire, as well as the outlets to the enceinte ditch. A tenailled line, the reëntering angles of which are between 90 and 100 degrees, and the salient angles not less than 60 degrees, forms a tenailled system. Consult Mahan, revised by James Mercur, *Permanent Fortifications* (New York, 1888). See FORTIFICATION.

TENANCY, JOINT. See JOINT TENANCY.

TENANCY AT SUFFERANCE (OF. *tenance*, from Lat. *tenere*, to hold, retain). A legal term defining the occupation of land. When a tenant enters upon land lawfully, but continues in possession through the neglect of the landlord, he is a tenant at sufferance. Such is a holding over after a lease has expired, or the possession of land under a parol agreement of sale.

The distinction between such a tenancy and a tenancy at will has been lost sight of in modern law. The statutes of various states have defined the relationship of landlord and tenant, and in what manner a tenancy may be terminated and possession recovered. See LANDLORD AND TENANT; TENANCY AT WILL.

TENANCY AT WILL. A tenancy which is terminable at any time by either the landlord or the tenant. The term is used indiscriminately with tenancy at sufferance (q.v.), but the latter means a holding without the expressed consent of the landlord, and the former a tenancy whose duration is uncertain. The death of either party or the alienation of the land, by deed or written lease, effects a termination of the tenancy. At common law a tenant at will was not entitled to notice to quit. It is now usually required. Any knowledge brought home to the tenant that may be construed as a notice to quit is sufficient, such as a demand of possession. Modern statutes provide the exact steps to be taken to dispossess a tenant at will. There being no definite term, assignments of leases at will are not valid, and operate as a notice of the tenant's election to terminate the tenancy. See LANDLORD AND TENANT.

TENANCY BY ENTIRETY. See ENTIRETY, TENANCY BY.

TENANCY IN COMMON. An interest or estate in real or personal property resting in joint possession and held by several persons at the same time by several and distinct titles. See COMMON, TENANCY IN; JOINT OWNERSHIP; and consult authorities referred to under REAL PROPERTY.

TENANT FOR LIFE. See LIFE ESTATE.

TENANT RIGHT. In English law a custom which is recognized in some districts in Ireland, under which a tenant is conceded the right to continue to occupy land upon which he has made improvements, practically indefinitely without the payment of an increased rent. By the Land Act of 1870 the custom was recognized. See LANDLORD AND TENANT.

TENAS′SERIM. The southernmost division of Lower Burma (see BURMA), bordering on Siam, and comprising the districts of Salwin, Amherst, Tavoy, Thaton, Toungu, and Mergui (Map: Burma, C 4). Tenasserim is a narrow strip of coast about 500 miles long, with a varying breadth of from 40 to 80 miles, extending from the Pakchan River northward to the Salwin. Area, 36,086 square miles. Pop., 1901, 1,137,776; 1911, 1,406,264.

TEN BRINK, JAN. See BRINK, JAN TEN.

TENCH (OF. *tenche*, Fr. *tanche*, from ML. *tenca*, Lat. *tinca*, tench). A small European cyprinoid carplike fish (*Tinca vulgaris*), an inhabitant of ponds and stagnant waters. It is deep yellowish brown and usually about a foot long. Its flesh is poor. See Plate of CARPS AND ALLIES.

TENCIN, tän′sän′, CLAUDINE ALEXANDRINE GUERIN DE (1681–1749). A French novelist, prominent in the literary society of the Regency. She was born at Grenoble, and was placed in the Convent of Montfleury as a novice, whence a sympathetic Lothario rescued her. She next appeared at Paris as an unscrupulous friend of Cardinal Dubois (1714), gathering about her a crowd of admirers, among them Fontenelle, Law, and the Regent. With the death of the Regent Orléans (1723) her influence waned. In 1726 she suffered a brief imprisonment in the Bastille because a desperate lover had killed himself in her house. Later her reputation revived; she became decorous and popular with her former friends, including Duclos, Lamotte, Marivaux, Marmontel, Montesquieu. She wrote three novels, mingling history with fiction: *Les mémoires du comte de Comminges* (1735), *Le siège de Calais* (1739), and *Les malheurs de l'amour* (1747), the last a bit of psychic autobiography. The strength of these tales lies in their scenes of dread and gloom. Her nearest literary analogue is Madame de La Fayette (q.v.). Madame de Tencin was the mother, through one of her many illicit connections, of D'Alembert (q.v.). Her correspondence with her brother, Cardinal de Tencin (1680–1758), appeared in Paris in 1780, that with the Duke de Richelieu in 1806. Alleged *Mémoires secrets* were published by Barthélemy (Grenoble, 1790). Tencin's *Œuvres*, with those of Madame de Fontaines, were published by Garnier (Paris, 1864).

TEN COMMANDMENTS. See Decalogue.

TENDA, tĕn′dȧ, Col di. A pass over the Maritime Alps in Italy near the boundary of France and 25 miles from the Mediterranean coast (Map: Italy, A 2). Its altitude is 6145 feet, and it carries the railroad from Cuneo to Ventimiglia. The carriage road from Cuneo to Nice passes here through a tunnel nearly two miles long and lighted by electricity.

TENDAI-SHU, tĕn-dī′shōō′ (Chin. *T'ien-tai Tsung*, name of a mountain in China where the founder of the sect studied). A sect of Japanese Buddhists, established towards the end of the eighth century by a Japanese priest named Dengyo Daishi. Like all Japanese sects, it is of the Northern School, and is based upon the *Saddharma Pundarika*, or Lotus of the Good Law. Salvation lies in the perception of the original and absolute Buddha, of whom the historic Buddha is one manifestation. The means of salvation are meditation and wisdom. It has an exoteric teaching for the vulgar, while its esoteric doctrines are reserved for the monks, although the highest truths are recognized as transcending human comprehension. The sect is eclectic, and various Buddhas are worshiped in its temples. It completed the triumph of Buddhism in Japan by declaring that the Shinto deities are manifestations of Buddha. As it attempted in its teachings to reconcile contradictory doctrines, it gave rise to schism and became the mother of many sects. Its centre was on the mountain near Kyoto called Hiyei-zan. Its priests, though devoted by profession to meditation, became very warlike in the Middle Ages. Nobunaga (q.v.) in 1571 A.D. destroyed the monastery, and killed the inhabitants. The sect never regained its commanding position. Consult Nanjō, *Short History of the Twelve Japanese Buddhist Sects* (London, 1887); W. E. Griffis, *The Religions of Japan* (New York, 1895); G. W. Knox, *The Development of Religion in Japan* (ib., 1907).

TEN′DENCY (from Lat. *tendens*, pres. p. of *tendere*, to stretch, tend; connected with Gk. *τείνειν*, *teinein*, to stretch). A term in psychophysics denoting the nervous disposition which underlies some phase of mental constitution. Thus, perseverative tendency is the tendency of a nervous impression to persist, and of the correlated mental formation to reëmerge. Associative tendency is a connection between two impressions such that, if the one is reëxcited the other tends to be excited. Determining tendency (q.v.) represents a set of the nervous elements such that a course of successive associative tendencies is directed to some single end.

Tendencies are either natural, i.e., based on inheritance and transmitted through the nervous system, or they are acquired during the lifetime of the organism. The conditions for setting up impressional and associative tendencies are the secondary laws of association (see Association of Ideas), and determining tendencies are acquired either through habit or as the result of some salient experience. See Disposition; Habit; Memory; Mental Constitution; Temperament.

TEN′DER (from ME. *tender*, OF., Fr. *tendre*, from Lat. *tendere*, to stretch, extend). As a legal term the formal offer to perform an obligation under such circumstances as to make no further act necessary on the part of the person making the tender.

The term is frequently used with reference to the payment of money, but it includes any act, such as an offer to perform or to deliver goods. If the obligation is to pay money it must be made in legal tender (q.v.). The rule has been relaxed in some states and a tender of a check or bill of exchange is good unless the debtor rejects the tender on the ground that it is not lawful money. If the creditor prevents or specifically waives the tender the necessity is dispensed with. If the tender is a fulfillment of the obligation it is a complete defense to an action.

The debtor must keep the tender good and be ready at all times to perform. By statutes in many states, even after action is brought, he may pay into court the sum he admits to be due with interest and costs up to date. The sum so paid becomes the property of the creditor. If he does not accept it he proceeds at the risk of having costs awarded against him should the court determine such tender was sufficient. Consult A. P. Hunt, *Treatise on the Law of Tender* (St. Paul, 1903). See Legal Tender; Mortgage; Pledge.

TENDILLA, Count of. See Mendoza, Antoine de.

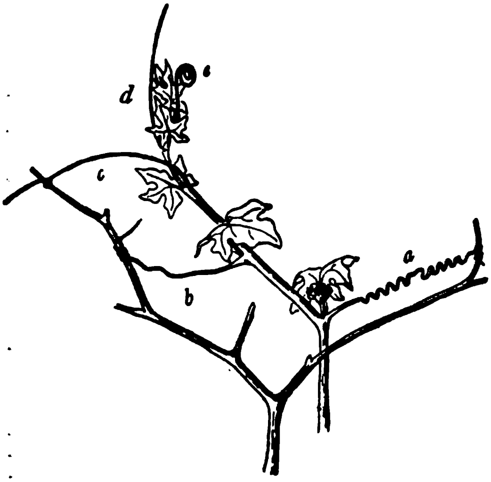
TEN′DON (from ML. *tendo*, tendon, from Lat. *tendere*, to stretch, extend). A term employed in anatomy to designate the structure of white fibrous tissue reaching from the end of a muscle to bone or some other structure which is to serve as a fixed attachment for it, or which it is intended to move. In accordance with their form, tendons have been divided into the three following varieties: (1) Funicular, or ropelike, as the long tendon of the biceps muscle of the arm; (2) fascicular, as the short tendon of that muscle, and as most tendons generally; and (3) aponeurotic, or tendinous expansions, sometimes of considerable extent, and serviceable in strengthening the walls of cavities, as, for example, the tendons of the abdominal muscles.

The tendons begin by separate fasciculi from the end of each muscular fibre, and they similarly terminate by separate fasciculi in distinct depressions in the bones, besides being closely incorporated with the periosteum. Tendons, together with their sheaths, are subject to acute and chronic inflammations and to tumor formation. The ordinary acute form of inflammation known as acute tenosynovitis is usually brought about by injury, such as a blow or by overuse. The chronic form of inflammation is usually tuberculous, though a rheumatic diathesis sometimes occurs. The tumors commonly observed in tendons are small fibrous and cartilaginous enlargements. Such growths occasionally assume a malignant character. When separation of a tendon occurs either by rupture or incision, if the divided ends are not too widely separated, repair takes place by the deposition of new fibrous tissue, closely resembling true tendon tissue. This repair is usually complete at the end of three weeks.

TEN′DRAC. See Tenrec.

TEN'DRIL (Fr. *tendrille*, from *tendre*, tender, from Lat. *tener*, delicate; connected with *tenuis*, Gk. *ταναός*, *tanaos*). A slender, usually cylindrical organ of higher plants used for climbing. As to their origin, tendrils may occupy the position of leaflets, or of leaves, normally subtended by branches, or of branches usually subtended by leaves. The last two sorts, however, are not always easily distinguished. Some tendrils are coiled when young, unrolling as they mature; others are merely bent, or straight, or variously folded. At maturity they are usually slightly hooked near the apex.

Structurally, tendrils contain vascular bundles, surrounded by a cortex of thin walled and somewhat elongated parenchyma cells, covered by a delicate epidermis. (See HISTOLOGY.) Physiologically, they are sensitive to friction, often remarkably. Sensitiveness is ordinarily greatest on the concave side of the curved tip, though some tendrils are sensitive on the flanks and others sensitive on all sides. In tendrils sensitive on the concave flank a single stroke on this flank is followed by a rapid growth on the convex flank exactly opposite, also a great increase in the rate of growth in the middle line. This reaction is followed a little later by an autotropic straightening. Therefore, the total result of a single stroke leaves the tendril unaltered in shape. It is only by repeated strokes along much of the concave flank that the tendril finally closely grasps the support. The petioles of some leaves, e.g., *Clematis*, show a similar but less acute sensitiveness to friction, making one turn about a support. *Uncaria* has short conical hooks, which are stimulated by contact and friction to grow in such a way that they enlarge greatly and curve about a support. Tendrils of wall-climbing ivies often form glandular disks that attach them. After a tendril has laid hold of an appropriate support the portion between the support and the axis of the plant is brought under strain, to which it responds by unequal growth on opposite flanks (on one side). By this means it is thrown into a spiral with one or more points of reversal (a mechanical necessity when a once straight cylindrical body elongates on one side and so coils up). The coils develop mechanical tissues, and the most perfect tendril thus becomes a strong, uniformly coiled, elastic spiral spring which supports the plant. See LIANAS.



TENDRILS OF BRYONY.

a, a tendril that has attached itself and is coiling, with reversal of coils in centre; *b*, a recently attached tendril, the unequal growth just beginning; *c*, one just attached; *d*, one just straightened out; *e*, one still coiled from the bud.

TEN'EBRÆ (Lat., darkness). A service in the Roman Catholic church; the matins of Thursday, Friday, and Saturday in Holy Week, generally sung on the preceding evening. The name is taken from the opening of the Responsorium following the fifth lesson on Good Friday, *Tenebræ factæ sunt*. The service consists of sixteen psalms and a canticle from the Old Testament, sung with their proper antiphons in fourteen divisions, nine lessons, nine responsories, the canticle Benedictus, and the Miserere. Most of the service is in unisonous plain chant. At the conclusion of each psalm and antiphon one of the fifteen candles in the triangular candlestick used for this special service is extinguished with ceremony. During the singing of the Benedictus the six altar candles are put out one by one. The only light remaining is the candle at the apex of the candlestick. This is removed and carried behind the altar. After the singing of the antiphon, *Christus factus est pro nobis obediens usque ad mortem*, a silence follows during which the Paternoster is whispered in secret; after the Miserere a prayer is made and the candle is brought from behind the altar. Then, according to the rubric, "all rise and depart in silence."

TEN'EDOS. An island in the Ægean Sea, five miles from the northwest coast of Asia Minor. Its situation near the entrance of the Dardanelles gives it strategic importance (Map: Greece, G 4). Area, 16 square miles. The only town which bears the name of the island is inclosed by walls and has an old castle and remains of the storehouses erected by Justinian. The surface of the island is uneven and rocky, but the soil is fairly fertile. Wine is the most important product, about 5,000,000 gallons being annually exported. Population, about 4000, two-thirds of whom are Greeks. Tenedos was successively under the control of Persia, Athens, Rome, the Byzantine emperors, and Venice. It figured in the Trojan War. Since 1455 it has been a Turkish possession, and is included in the Archipelago Vilayet.

TEN'EMENT (Lat. *tenementum*, a holding, fief, from *tenere*, to hold, retain). In the strict legal sense, anything of a permanent nature, corporeal or incorporeal, which may be held or be an object of tenure (q.v.). In the law of real property the term is used in a broad sense and denotes any estate or interest in land. Popularly, tenement means any rented house. See REAL PROPERTY.

TENEMENT-HOUSE AND HOUSING REGULATION. See TOWN PLANNING AND HOUSING.

TENEMENT-HOUSE LAW. The name by which are known various laws passed by municipalities in an effort to prevent unhealthful congestion of population. Perhaps the best known of these is the New York Tenement House Law of 1901, sometimes known as the "New Law." See APARTMENT HOUSE; BUILDING LAWS; CITY PLANNING; HOUSING PROBLEM; TOWN PLANNING AND HOUSING.

TENEMENT-HOUSE PROBLEM. The problem of the making possible a healthful human existence under the conditions of dense population in our modern cities. With the growth of great cities, a double movement of population takes place. The well-to-do are driven from former residential districts by the encroachments of business, while working people crowd into their vacated houses. Rear tenements are built behind the old houses; new structures are put up solely for use as tenements; and the whole process is left in the hands of private builders and landlords, ill regulated by the municipality, until its two most obvious evils, the danger from epidemics and the danger from fire, force themselves upon public attention.

The first step in reform is legislation compelling the destruction or renovation of existing dwellings that are unsanitary, but it is equally important to provide for rehousing the displaced population, and to see that new tenements are properly built. These problems have been attacked by sociologists and legislators in nearly all centres where there is great congestion of population and are discussed under Apartment House; Building Laws; City Planning; Housing Problem; Town Planning and Housing.

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TENERANI, tā'nȧ-rä'nē, Pietro (1789–1869). An Italian sculptor, born at Torano, near Carrara. He studied at the Carrara Academy and later in Rome under Thorvaldsen, to whom he became a favorite assistant, and by whom he was strongly influenced. Tenerani was appointed professor at the Academy of St. Luke and was the leader of Roman art during the middle of the nineteenth century. His work is in the classicist style and is characterized by dignity, refinement, and harmony of line. Among his best-known sculptures are the group "Cupid and Venus" (Chatsworth); the bas-reliefs of "Charity" (Castle Ashby Church, Northamptonshire); the "Deposition from the Cross," in the Lateran (Rome); an "Angel of the Resurrection," in Santa Maria sopra Minerva, Rome (replica in the Friedenskirche, Potsdam); and the tomb of Pius VIII in St. Peter's. He was one of the first Italian sculptors to use modern costume for his fine portrait statues, which include those of Bolívar (Colombia, South America) and of Pellegrino Rossi (Carrara).

TEN'ERIFFE' (Sp. *Tenerife*). The largest of the Canary Islands (q.v.), a little west of the centre of the group, between the islands of Palma and Gran Canaria (Map: Spain, F 4). Area, 782 square miles. It consists of a nearly circular main portion from which a peninsula projects northeast. The latter consists of ancient, eroded, and forest-covered mountains, while the main portion rises into the magnificent Peak of Teneriffe or Pico de Teyde, a dormant volcano 12,192 feet high. The base of this enormous cone consists of pasture land interspersed with forests of chestnut and oak, but the steep upper slopes are covered with volcanic scoriæ, the summit being capped with snow in winter. The last serious eruption of the volcano occurred in 1910. The climate is mild and healthful, and dates, coconuts, and other tropical and northern fruits are cultivated, as well as grain, cotton, sugar, and grapes. Pop., 1900, 137,302; 1910, 180,307. The capital of the island and of the whole archipelago is Santa Cruz de Tenerife (q.v.).

TENERIFFE, Marquis of. See Weyler, N. V.

TENES'MUS (Neo-Lat., from Lat. *tenesmos*, from Gk. *τεινεσμός*, *teinesmos*, a straining at stool, from *τείνειν*, *teinein*, to stretch). Pain referred to the rectum or bladder, due to the spasmodic contraction of the sphincter ani or sphincter vesicæ, and associated with an unsuccessful desire to evacuate the bowels or bladder. Rectal tenesmus is a constant symptom of dysentery (q.v.), and may accompany hemorrhoids, fissure, fistula, or malignant disease of the lower rectum. Causes of vesical tenesmus are chiefly cystitis (q.v.) and pressure on the bladder. Treatment will depend on the disease of which tenesmus is a symptom, but cold or hot applications, enemas containing laudanum, or suppositories of opium, cocaine, belladonna, or hyoscyamus will relieve the pain.

TE'NIA. See Tapeworm.

TENIERS, tĕ-nērs'; *often, as Fr.*, te-nyā', *or, as Eng.*, tĕn'yĕrz, David, the Elder (1582–1649). A Flemish genre and landscape painter. He was born at Antwerp, and studied with his brother Juliaen, under Rubens, and then with Elsheimer at Rome. Many of his early subjects, painted in the manner of Elsheimer, were landscapes with mythological figures, of which eight are in the Vienna Museum. He essayed also religious and mythological subjects, but his chief importance is as a genre painter, particularly of peasant scenes, kermesses, and the like, rendered with wholesome humor and in an individual style. Typical examples of his work are the "Temptation of Saint Anthony" (Berlin Museum); "Peasants Carousing in Front of a Tavern" (Darmstadt Gallery); and "A Dutch (properly Flemish) Kitchen" (Metropolitan Museum, New York). He is well represented also at Brussels, Munich, Dresden, St. Petersburg, Madrid, and in the National Gallery, London.

TENIERS, David, the Younger (1610–90). The principal genre painter of the Flemish school. He was born at Antwerp, the son and pupil of the preceding. Before he was twenty his work bore the stamp of maturity, and in 1633 he entered the guild as master. His early manner and choice of subjects is represented by such examples as "The Prodigal Son" (Pinakothek, Munich), "The Five Senses" (Brussels Museum), "A Merry Repast" (Berlin Museum), and "The Misers" (1634, National Gallery, London). The delineations from peasant life, which thenceforth were his chief productions, show the influence of Adrian Brouwer, although there is no evidence of Teniers having been his pupil. Of more than 100 such pictures which Teniers painted, some of the most characteristic are: the "Interior of Village Inn," "Flemish Tap-Room" (1643); "Peasants' Dance" (1645); "The Smokers" (1650, all in the Pinakothek, Munich); "Hour of Rest" (Amsterdam), "Smoking Club" (Dresden), and "Backgammon Players" (1641, Berlin). Brouwer's spirit also prevails in subjects like "The Dentist" and "The Barber Shop" (both in Cassel), "The Village

Doctor" (Brussels); also in various treatments of "The Alchemist" (The Hague and Dresden), and of the "Temptation of Saint Anthony" (Brussels, Dresden, and—dated 1647—Berlin).

In 1637 Teniers married Anna Breughel, the daughter of Jan Breughel and ward of Rubens, who was one of the marriage witnesses. Soon after the death of Brouwer in 1638 the influence of Rubens became apparent in Teniers's coloring, which changed to a warm golden tone with rich and luminous local colors, and in the dramatic life animating his large compositions. This phase is well exemplified by a "Peasants' Dance" (1640, Berlin) and the "Flemish Kirmess" (1641, Dresden, Vienna, Madrid; 1652, Brussels and Amsterdam). Especially remarkable for the number of figures is "The Great Italian Fair" (Munich), and interesting portrait groups are represented in "The Artist and his Family" (c.1645, Berlin) and "Teniers in Front of his Castle near Perck" (National Gallery, London). In 1642 he was commissioned to paint for St. George's Guild an "Archers' Festival" (St. Petersburg), containing 45 characteristic portrait figures. A few scenes from military life are depicted in the fine "Guard Room" (Amsterdam), "Robbers Plundering a Village" (1648, Vienna), and "Relief of Valenciennes by the Spaniards" (Antwerp). His few religious paintings are unimportant.

After Teniers had, about 1643, become lord of the manor of Dry Toren (Three Towers), near Brussels, he seems to have been more than ever absorbed in rural life and work, as may be seen in the "Cow Stable," and "Goat House" (Vienna), especially noteworthy for their chiaroscuro. In 1644 he was chosen head of the painters' guild in Antwerp, appointed court painter to Archduke Leopold William, Regent of the Netherlands. He removed to Brussels in 1650. He depicted notable events in the life of the Archduke and his consort, Isabella, including the "Shooting Match at Brussels" (1652, Vienna), containing more than 470 figures. As director of Leopold's gallery he was in charge of extensive purchases, and he painted a series of interiors, faithfully representing these treasures to the minutest detail (Munich, Vienna, Madrid, and Brussels). Among the works of Teniers's later period are rural scenes and landscapes, besides his parodistic monkey pictures, of which three are in the Pinakothek, Munich. Unique among his works is the "Sacrament of the Miracle of St. Gudule" (Berlin), painted on white marble, the grain of which is visible through the colors. The Metropolitan Museum, New York, possesses a "Marriage Festival" and a "Temptation of Saint Anthony," and four others, two being landscapes after Bassano.

Teniers left in all about 900 paintings. Consult: Alfred von Würzbach, "David Teniers der Jüngere," in Robert Dohme, *Kunst und Künstler des Mittelalters*, vol. xx (Bielefeld, 1877); Adolph Rosenberg, "David Teniers der Jüngere," in *Künstler Monographien, No. 8* (ib., 1895); *Masters in Art*, vol. viii (Boston, 1907); Roger Peyre, *David Teniers: Biographie Critique*, in "Les Grands Artistes" (Paris, 1911); Oscar Schellekens, *Les trois David Teniers* (Termonde, 1912).

TENIM′BER. A group of islands in the Malay Archipelago. See Timorlaut.

TENINO, tâ-nē′nō. A tribe of Shahaptian stock (q.v.) formerly claiming most of the Deschutes River country of northern Oregon, and now gathered with other tribes upon Warmspring reservation in the same region. In 1855 they made their first treaty with the government, and agreed to come upon their present reservation. See Shahaptian Stock.

TEN KATE, Jan J. L. See Kate, Jan J. L. Ten.

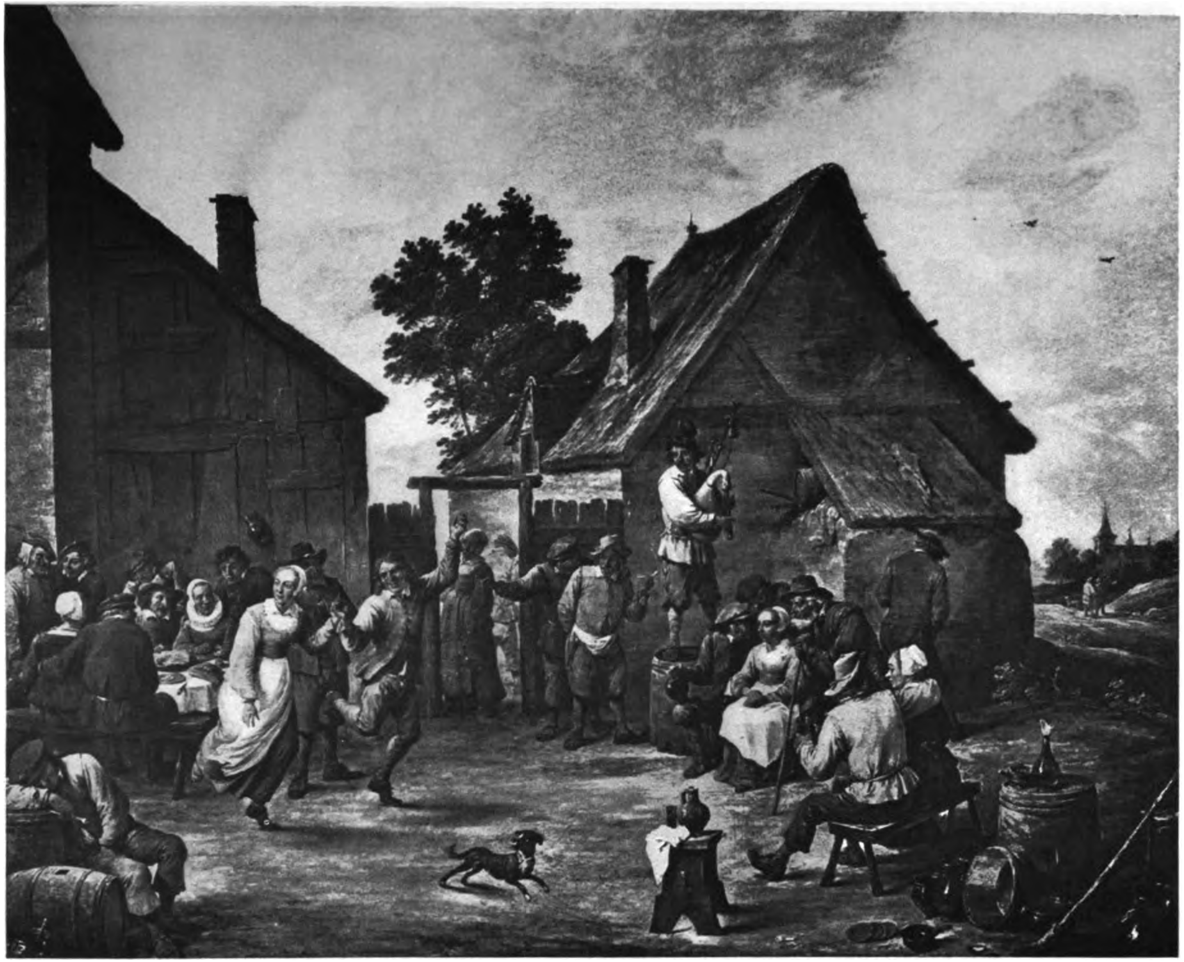
TEN′LIE. See Jackal.

TEN′NANT, Charles (1768–1838). A British chemist. He was born in Ochiltree, Scotland, and followed the trade of bleaching. While experimenting, he found that by passing chlorine into lime suspended in water, a product was obtained that possessed similar properties to the javelle water, then generally used as a bleaching agent. The new product was found to be much the cheaper. He was given a patent for his process in 1798, but was unable to protect it against frequent infringement. Later he patented a process for making bleaching powder by passing chlorine over slaked lime, a method that is still of commercial value and extended use. In 1800 he founded the St. Rollox Chemical Company in Glasgow.

TENNANT, Frederick Robert (1866–). A British theologian, born at Burslem, Staffordshire. He was educated at Caius College, Cambridge, and after teaching held various livings in the Church. At Cambridge he was Hulsean lecturer in 1901, lecturer on the philosophy of religion in 1907, and lecturer on theology and fellow of Trinity College after 1913. His publications include: *The Origin and Propagation of Sin* (1902; 2d ed., 1906); *Sources of the Doctrine of the Fall and Original Sin* (1903); *The Concept of Sin* (1912).

TENNANT, Smithson (1761–1815). An English chemist. He was born in Selby, Yorkshire, and was educated at Edinburgh and Cambridge (M.D., 1790). Devoting himself to scientific investigation, especially in agriculture and chemistry, he made a famous discovery of the elements iridium and osmium, which he found in the residues obtained in the purification of native platinum. In 1813 he was called to a chair of chemistry in Cambridge.

TENNANT, William (1784–1848). A Scottish poet. He was born at Anstruther, Fifeshire, Scotland. A cripple almost from his birth, he naturally turned to study. In 1799 he entered the University of St. Andrews, which he left after two years to become clerk to his brother, a corn agent. The business proving unsuccessful, he was glad to accept in 1813 the situation of parish schoolmaster at Dunino, a small village about four miles from St. Andrews, with a salary of £40 a year. In 1812 he had published his *Anster Fair*, a poem of much sprightliness and humor. The piece gradually made its way, aided by a highly laudatory notice in the *Edinburgh Review*, from the pen of the then omnipotent Jeffrey. In 1816 Tennant became teacher of a school at Lasswade, near Edinburgh, whence three years afterward he was transferred to the Dollar Academy in Clackmannanshire. His attainments as a linguist were by this time extraordinary. In 1834 he was appointed professor of Oriental languages in the University of St. Andrews. In connection with his new duties he published a *Syriac and Chaldee Grammar* (1840). He died at Devon Grove, Oct. 14, 1848. Besides other miscellanies in verse, Tennant published: *The Thane of Fife, a Poem* (1822); *Cardinal Beaton, a Tragedy* (1823); and *John Baliol, a Drama* (1825). None of these later



DAVID TENIERS—THE RUSTIC WEDDING
FROM THE PAINTING IN THE PINAKOTHEK, MUNICH

productions increased the literary reputation which his first work had won for him. Consult Conolly, *Life of William Tennant* (Edinburgh, 1861).

TEN'NENT, Gilbert (1703–64). An American Presbyterian minister, born in County Armagh, Ireland. In 1718 he came to America with his father, William Tennent, who is known as the founder of a theological school at Neshaminy, Pa., called, because of the way it was housed, the Log College. Many eminent clergymen were trained there. Gilbert early assisted his father, studied medicine and theology, and was ordained pastor of a church in New Brunswick, N. J., in 1726. This connection he continued until 1743, though traveling and preaching with Whitefield in New England for several months. Then he founded and became pastor of a church in Philadelphia, with which he remained until his death. In 1753 he visited England with President Davies to obtain aid for the College of New Jersey (later Princeton) and raised £1500. He published many sermons. For notices of Gilbert and other prominent members of the Tennent family, consult W. B. Sprague, *Annals of the American Pulpit*, vol. iv (New York, 1858).

TENNENT, Sir James Emerson (1804–69). A British traveler, politician, and author, born at Belfast, Ireland. He traveled through the Levant and Greece in 1824–25, and was a Liberal member of Parliament from 1832 to 1834, but from the latter year until 1845 was a Liberal-Conservative and follower of Sir Robert Peel. In 1842 he secured the passage of the bill granting copyrights to designers. He was secretary to the India Board (1841–43); civil secretary to the Ceylon colonial government (1845–50); and shortly after his return to England, again entered Parliament (1852). There he was successively secretary for the Poor Law Board (1852) and a joint secretary of the Board of Trade (1852–67). After resigning the latter post he was made Baronet. Under his original name of Emerson, to which he had added his wife's name, Tennent, Sir James published a number of books, including: *A Picture of Greece in 1825* (1826); *Christianity in Ceylon* (1850); *Ceylon: An Account of the Island* (2 vols., 1859); *Sketches of the Natural History of Ceylon* (1861); and *The Story of the Guns* (1865).

TENNESSEE, tĕn'e-sē'. A south central State of the United States, popularly called the Volunteer State. It lies between lat. 34° 59′ and 36° 41′ N. and between long. 81° 37′ and 90° 17′ 27″ W., and has an extreme length of 491.12 miles and an extreme breadth of 113.55 miles; its area is 42,022 square miles, of which 335 are water. It ranks as the thirty-fifth State in size.

Topography. The surface is divided into seven well-marked topographical regions. The easternmost is a belt with a maximum width of 10 to 15 miles—the Appalachian Mountain region. It is formed by the Great Smoky and Unaka Mountains, whose main ridges average 5000 feet in elevation and in places exceed 6000 feet. Mount Guyot has an elevation of 6636 feet. Next westward is the Great valley of East Tennessee, a depression 30 to 60 miles wide, consisting of an alternate succession of parallel ridges and valleys. Next to the west is the Cumberland plateau, with an average elevation of about 2000 feet and an extreme elevation of 3550 feet. The eastern edge of this plateau is a straight, abrupt scarp, but its western edge has been deeply crenulated by headwater stream erosion. Next is the highland rim or plain, with an elevation of about 1000 feet along its eastern border and 600 or 800 feet along its western margin, which lies, for the most part, a few miles west of the Tennessee River in its northern course across the State. Within the highland plain and 300 to 400 feet below its level, in middle Tennessee, there is an oval depression about 125 miles long and 60 miles wide, known as the central basin. West of the highland plain is the West Tennessee plain, 600 to 800 feet high on its eastern border, with a westward slope to 300 or 400 feet where it overlooks the alluvial plain of the Mississippi. This latter is a narrow belt, largely swampy, with a depressed area in the north containing Reelfoot Lake.

Hydrography. The drainage of the entire State reaches the Mississippi River. The eastern portion is drained by the Tennessee River, which flows southwestward into Alabama, then turns and flows northward across the State. The Cumberland, heading in southeastern Kentucky, flows southwestward into the central basin, turns northward, like the Tennessee, and flows across western Kentucky to the Ohio. The West Tennessee plain is drained directly into the Mississippi through the Wolf, Hatchie, Forked Deer, and Obion rivers. The Cumberland and Tennessee, with a few of the larger tributaries of the latter in East Tennessee, are navigable, but are undergoing further improvement. Much power has been developed in the upper part of the Tennessee River and much more awaits development both on it and on the Cumberland.

Climate. The climate is usually mild and equable. The mean annual temperature is 58° F., and the variation from this is not over 2 or 3 degrees in any section, except the Appalachian region, where the mean is 45° F. July, with a mean of 78° F., is the hottest month, and January, with a mean of 38° F., the coldest. The maximum rarely exceeds 100° F., but has reached 106° F.; and the minimum seldom falls below 10° F., though zero is reached occasionally, and — 30° F. has been recorded in the Cumberland plateau. The annual rainfall averages about 50 inches and is well distributed geographically. The average annual snowfall is about 8 inches. The prevailing winds are from the south and southwest.

Soils. The soils of the various topographic regions differ greatly because of differences in the nature of the underlying rocks. The alluvium of the Mississippi and other river bottoms forms the richest soil. The uplands along the Mississippi bluffs have a fertile soil of loess and brown loam that to the east becomes sandy, and near the Tennessee River is in places barren. Where the rocks of the highland plain are siliceous shales the soils are poor, but where they are limestone fertile soils result. The central basin and the eastern valley have very fertile limestone soils; the Cumberland plateau is poor and sandy; and the Appalachian region thin and stony on steep slopes and rich and deep in coves.

Flora. Numerous species of oak, as well as poplar (*Liriodendron tulipifera*), chestnut, maple, beech, hickory, walnut, locust, persimmon, and dogwood are common throughout the State. In the higher mountains white pine, birch, ash, and hemlock are also found. In the Cumberland plateau short-leaf pine is common. Red cedar is common in the central basin, and in the river swamps of the west cypress, red gum, swamp oak, and cottonwood are characteristic.

About 55 per cent of the area of the State is forested. The most valuable timber is in the mountain coves and the Mississippi swamps.

Geology. Differences in the kind and attitude of the rocks correspond with, and are largely responsible for, differences in topography. The only igneous rocks are small areas of Archean granite, gneiss, and schist in the northern half of the high ranges of the eastern boundary. Elsewhere along this eastern border the rocks are much folded and metamorphosed siliceous sediments of Cambrian age. The rocks of the Great valley are chiefly of Cambrian and Ordovician age, though the Silurian and Devonian also occur. Limestones and dolomite form the valleys and sandstones, cherts and shales the intervening ridges. The rocks of the Cumberland plateau are of Pennsylvanian age, chiefly sandstones and shales. They and all to the west of them are flat-lying, while all to the east are highly folded and faulted. Mississippian limestones and shales form the highland plain, and with Silurian and Devonian rocks form the rim, while Ordovician limestones form the floor, of the central basin. The Silurian and Devonian rocks are prominent in the western valley of the Tennessee River. The West Tennessee plain consists of unconsolidated sands and clays, the eastern part of which overlap the Paleozoics of the highland plain and are of Cretaceous age, while farther west they are of Tertiary and more recent age.

Mineral Resources. A belt of limonite iron ore occurs in the western part of the highland plain, while another occurs along the eastern edge of the Great valley, and elsewhere in this valley are large deposits of zinc, marble, and bauxite, which along its western side is an important belt of red hematite. Large copper deposits occur in the extreme southeast. The Cumberland plateau contains a number of valuable coal seams, while phosphate is found in the central basin and large clay deposits occur in West Tennessee. In 1914 Tennessee ranked twenty-fifth among the States in value of mineral products. Coal is the most important of the minerals, and in 1914, 5,943,258 tons, valued at $6,776,573, were mined. Copper ranks second among the State's minerals, and in 1914 there were produced 18,737,656 pounds, valued at $2,492,108. The metal is obtained from pyritic ores, from which a large quantity of sulphuric acid is obtained as a by-product. In the production of phosphate rock Tennessee ranks second in the Union, and in 1914 produced 483,203 tons, valued at $1,822,770. Clay products were produced to the value of $1,546,315. The production of iron ore, chiefly hematite and brown ore, amounted to 330,214 tons, valued at $466,523. The pig iron produced was valued at $2,150,452. This is not included in the total of the State's production. Quarrying is another of Tennessee's important mineral industries. The principal products are marble and limestone, the former of which stands in high repute for interior decoration. The value of the stone products in 1914 was $1,932,462. Other mineral products of varying importance are clay products, zinc, mineral waters, and silver, cement, and lime. The total value of the mineral production in 1914 was $19,645,213.

Agriculture. The total land area of Tennessee is approximately 26,679,680 acres, of which 20,041,657 were in farms in 1910, 10,890,484 acres being improved land. The number of farms in that year was 246,012, averaging 81.5 acres. The total value of all farm property, including land, buildings, implements, and machinery, domestic animals, and bees was $612,520,836. The average value of land per acre was $18.53 in that year. Of the total number of farmers in 1910, 144,951 were owners and managers and 101,061 tenants. The white farmers numbered 207,704 and the nonwhites 38,308, of whom 73,504 and 27,557 respectively were tenants. The total acreage operated by whites was 18,435,579 and by nonwhites 1,606,078.

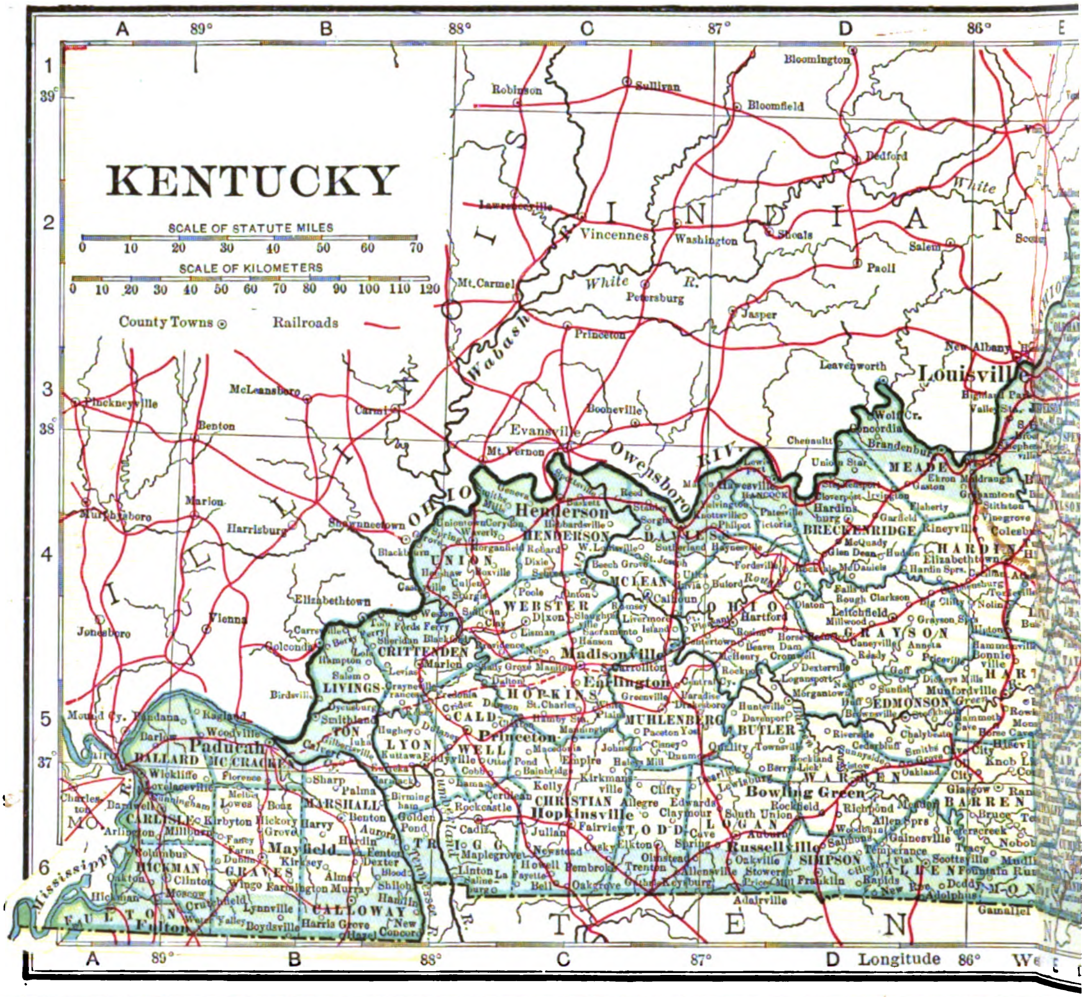
The acreage, production, and value of some of the principal crops as estimated by the United States Department of Agriculture for 1915 are as follows:

CROPS	Acreage	Production in bushels	Value
Corn..............	3,500,000	94,500,000	$54,810,000
Wheat	860,000	9,030,000	9,752,000
Oats..............	357,000	8,746,000	4,373,000
Rye...............	18,000	189,000	195,000
Potatoes (Irish).....	36,000	3,168,000	1,996,000
Sweet potatoes	27,000	2,835,000	1,673,000
Hay...............	950,000	* 1,396,000	19,404,000
Tobacco............	92,900	†69,675,000	4,390,000
Cotton.............	780,000	‡ 295,000	15,957,000

* Tons. † Pounds. ‡ Bales of 500 pounds gross weight.

The total value of all crops in 1909 was $120,706,211. The leading crops in that year in order of importance were corn, cotton, hay and forage, wheat, tobacco, cottonseed, and oats. In 1909 corn had an acreage of 3,146,348 and a production of 67,682,489 bushels, valued at $45,819,093. The acreage of cotton harvested was 787,516, and the production amounted to 264,562 bales, valued at $17,966,517. Under hay and forage were cultivated 1,052,816 acres, which produced 1,077,836 tons, worth $12,617,538. Wheat had an acreage of 619,861, the production amounting to 6,516,539 bushels, valued at $6,913,335. The area cultivated for tobacco was 90,468 acres, from which were produced 68,756,599 pounds, valued at $5,661,681. To potatoes were devoted 40,963 acres; the production was 2,922,713 bushels, valued at $1,790,233. Sweet potatoes and yams had an acreage of 26,216 and a production of 2,504,490 bushels, estimated at $1,625,056. Vegetables other than potatoes, sweet potatoes, and yams were grown over 100,055 acres, the production being valued at $7,015,686. Small fruits produced in 1909 amounted to 13,895,493 quarts, valued at $923,613. The acreage devoted to these was 12,539. Strawberries were the most important of the small fruits. Of the orchard fruits, apples and peaches were the most important. The total production in 1909 was 6,484,550 bushels, value $3,459,077. Other fruits grown were grapes, pears, plums, cherries, quinces, mulberries, and figs. Total of sorghum cane and sirup produced in 1909 was $1,146,000.

Live Stock and Dairy Products. In 1910 the total number of domestic animals reported was 4,465,500, valued at $106,608,122. The United States Department of Agriculture estimated that on Jan. 1, 1916, horses numbered 349,000, value $35,249,000; mules numbered 272,000, value $30,736,000; milch cows numbered 366,000, value $14,457,000; other cattle numbered 518,000, value $11,707,000; sheep numbered 661,000, value $2,710,000; swine numbered 1,531,000, value $10,411,000. The production of wool in 1915 was 1,953,000 pounds. In 1910 the number of



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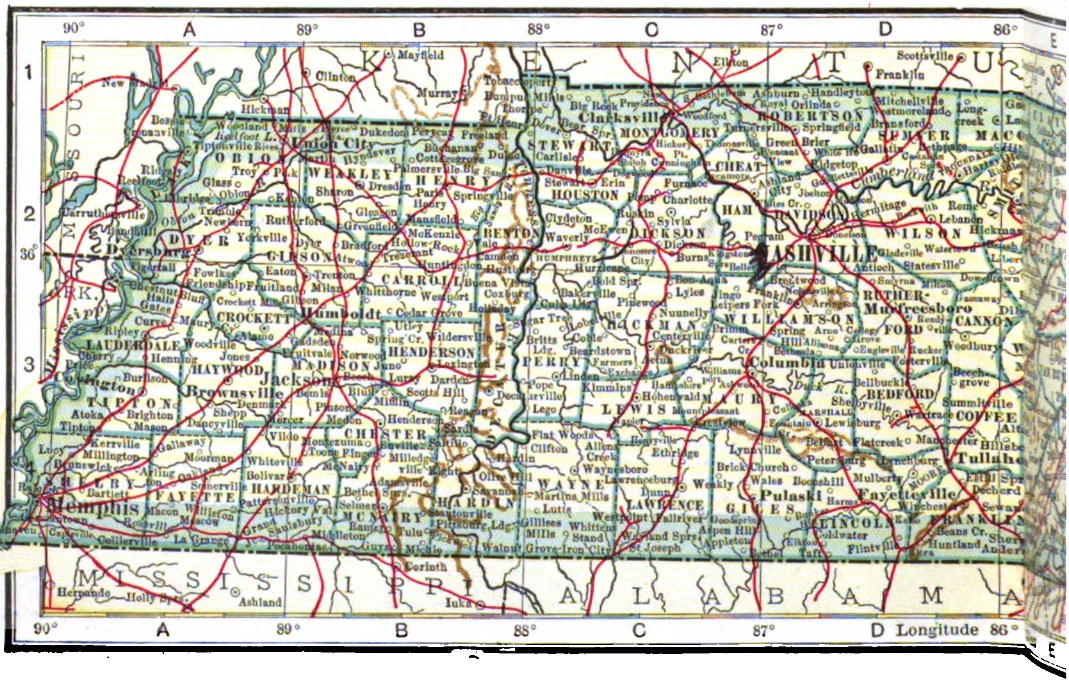

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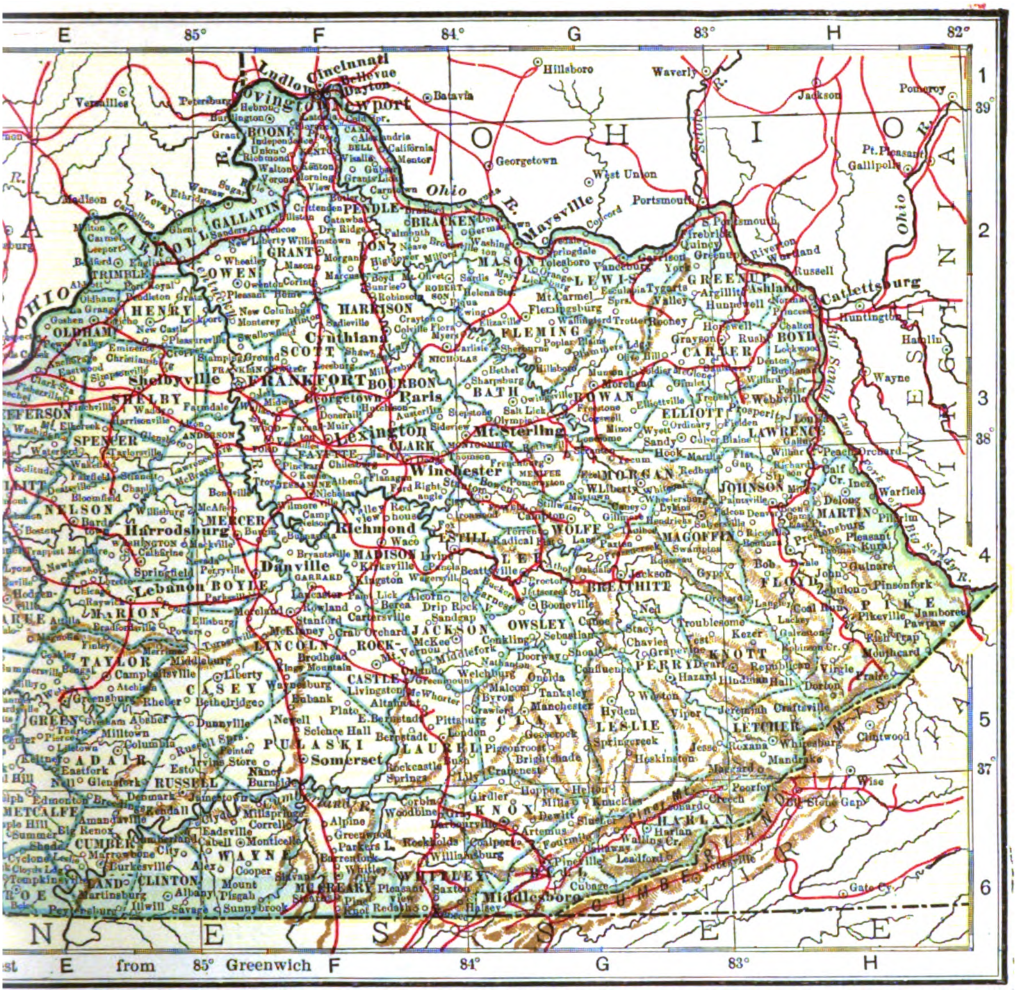
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Portsmouth
Maysville
Pt. Pleasant
Gallipolis
Catlettsburg
Huntington
Ashland
BOONE
GALLATIN
CARROLL
OWEN
GRANT
PENDLETON
BRACKEN
MASON
LEWIS
GREENUP
BOYD
HARRISON
ROBERTSON
FLEMING
CARTER
HENRY
TRIMBLE
OLDHAM
SCOTT
BOURBON
NICHOLAS
BATH
ROWAN
ELLIOTT
LAWRENCE
SHELBY
Shelbyville
FRANKLIN
FRANKFORT
Georgetown
Paris
Cynthiana
WOODFORD
Lexington
CLARK
Mt. Sterling
MONTGOMERY
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CLAY
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PULASKI
Somerset
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ADAIR
GREEN
RUSSELL
KNOX
HARLAN
WAYNE
CLINTON
CUMBERLAND
METCALFE
MONROE
McCREARY
WHITLEY
BELL
Middlesboro
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Big Sandy R.
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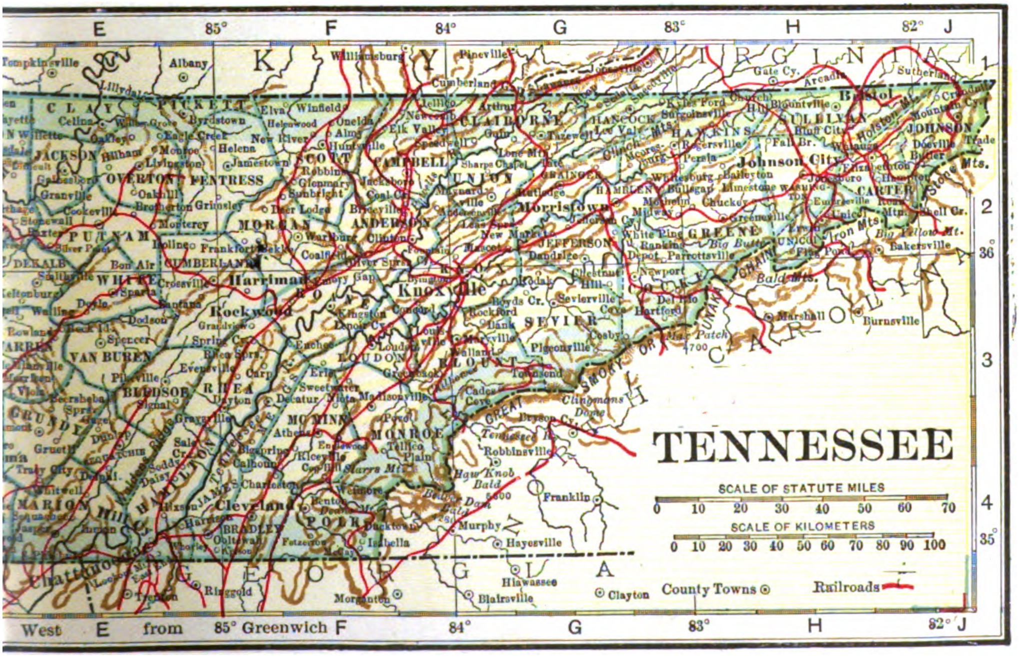
TENNESSEE

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Pineville
Cumberland Gap
Gate Cy.
Bristol
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FENTRESS
SCOTT
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CLAIBORNE
HANCOCK
HAWKINS
SULLIVAN
JOHNSON
JACKSON
OVERTON
MORGAN
ANDERSON
UNION
GRAINGER
HAMBLEN
Morristown
GREENE
WASHINGTON
Johnson City
CARTER
UNICOI
PUTNAM
CUMBERLAND
Harriman
KNOX
Knoxville
JEFFERSON
COCKE
DEKALB
WHITE
ROANE
Rockwood
LOUDON
BLOUNT
SEVIER
VAN BUREN
BLEDSOE
RHEA
MEIGS
McMINN
MONROE
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SEQUATCHIE
MARION
HAMILTON
BRADLEY
Cleveland
POLK
Chattanooga
Greeneville
Dandridge
Madisonville
GREAT SMOKY OR UNAKA MTS.
Clingmans Dome
Burnsville
Franklin
Murphy
Hayesville
Hiawassee
Blairsville
Clayton
Ringgold
Morganton
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SCALE OF KILOMETERS
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County Towns ⊙
Railroads
West
from
85° Greenwich

fowls was reported as 8,056,145, value $3,757,337. These produced 39,352,433 dozens of eggs, value $6,793,640. The milk produced was reported at 117,101,970 gallons, and the butter made at 39,827,906 pounds. Total value of all milk, cream, and butter fat sold and butter and cheese made in 1909 was reported at $8,715,441.

Forest Products. Tennessee is one of the most active lumbering States of the South. In 1908 there were about 15,000,000 acres of forest land whose trees represented over 100 varieties. (See *Flora.*) The number of active mills reported in 1913 was 1155, which produced 872,311 M feet board measure. Forest products produced on farms in 1909 were valued at $8,510,710. The total value of lumber and timber products in 1909 was $30,457,000. About 83 per cent of the products were hard wood. Most of this was oak, in the production of which Tennessee led the Union in that year. It also led in the production of yellow poplar and hickory.

Manufactures. In 1909 Tennessee ranked twenty-sixth in the Union in value of its manufactured products and the value per capita was $82. The following table gives the more important details regarding manufactures for the 10 leading industries in 1909 and 1904:

SUMMARY OF MANUFACTURES FOR 1909 AND 1904

THE STATE — TEN LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED IN INDUSTRY		Capital	Wages	Value of products	Value added by manufacture
			Total	Wage earners (average number)	Expressed in thousands			
All industries	1909	4,609	87,672	73,840	$167,924	$28,252	$180,217	$76,201
	1904	3,175	69,287	60,572	102,439	22,806	137,960	58,608
Cars and general shop construction and repairs by steam-railroad companies.	1909	17	5,884	5,566	4,035	3,252	6,777	3,661
	1904	16	4,939	4,760	2,029	2,617	5,839	2,861
Cotton goods, including cotton small wares.	1909	17	3,164	3,078	7,454	857	5,201	1,857
	1904	16	2,362	2,294	5,118	531	3,561	1,320
Flour-mill and gristmill products	1909	454	2,658	1,577	8,511	559	29,070	3,784
	1904	387	2,429	1,595	6,927	591	25,351	3,439
Foundry and machine-shop products.	1909	124	4,694	4,041	9,253	2,006	9,190	4,630
	1904	100	3,716	3,313	4,616	2,482	6,124	3,270
Hosiery and knit goods	1909	22	3,229	3,117	3,055	724	3,565	1,445
	1904	16	1,855	1,810	1,160	341	1,628	659
Iron and steel, blast furnaces	1909	18	1,268	1,143	7,122	519	4,653	1,272
	1904	13	1,486	1,358	5,688	546	3,428	819
Lumber and timber products	1909	1,977	26,283	22,389	30,159	6,966	30,457	16,816
	1904	1,122	19,705	17,277	20,431	6,456	26,864	15,274
Oil, cottonseed, and cake	1909	20	957	806	3,371	290	6,583	1,392
	1904	20	819	701	2,914	245	3,744	660
Patent medicines and compounds and druggists' preparations.	1909	76	998	433	2,225	148	3,515	2,174
	1904	47	739	489	1,317	143	2,789	1,888
Printing and publishing	1909	413	4,442	2,914	6,493	1,701	7,173	5,219
	1904	340	3,373	2,330	4,415	1,231	5,091	3,768

The production of lumber and timber products is the most important industry in value of products, number of persons employed, and number of establishments. In 1909, 1,223,849 M feet board measure of rough lumber, 31,179,000 lath, and 35,392,000 shingles were produced. (See *Forest Products.*) In 1909 the flour and grist mills produced 2,999,501 barrels of white flour, valued at $17,218,719; 1,981,746 barrels of corn meal and corn flour, valued at $6,505,710; and 26,720,930 pounds of hominy, valued at $441,371.

Of the total number of wage earners 64,648 were male. The wage earners under 16 years of age numbered 2445 of whom 813 were female. The prevailing hours of labor for about half the wage earners are 60 a week, and for about one-fourth from 54 to 60 a week. Leading cities and the value of their products in 1909 are: Memphis, $30,241,519; Nashville, $29,649,697; Chattanooga, $16,036,455; Knoxville, $8,149,377, and Jackson, $2,709,773. For further details, see these titles.

Transportation. Considerable water transportation is obtained on the Mississippi, Tennessee, and Cumberland rivers. A number of trunk-line railroads cross the State, most of them centring at Memphis and Nashville. The total mileage of all railroads in 1915 was 4165. The principal roads and their mileage are the Nashville, Chattanooga, and St. Louis, 900; the Louisville and Nashville, 861; the Southern, 764; the Tennessee Central, 292; the Cincinnati, New Orleans, and Texas Pacific, 142.

Banks. The first bank in the State was the Nashville Bank, established in 1807, with a capital of $200,000. In 1838 the Bank of Tennessee was organized with a capital of $5,000,000, all of which was to be supplied by the State, partly from funds on hand and partly by sale of bonds. It started with an actual capital of only $2,073,355, which was all the State could get together. In 1866, by order of the Legislature, the Bank of Tennessee was formally placed in liquidation, when its assets of $12,478,483 were found to consist mainly of Confederate bonds, certificates, treasury bonds, etc. In 1883 the State finally assumed the liability for the bank notes, and they were redeemed for special certificates of indebtedness. The depositors of the bank, including the State school fund, never realized any-

ITEMS	National banks	State banks
Number	116	404
Capital	$14,375,000	$14,897,911
Surplus	5,753,000	5,625,392
Cash, etc.	5,178,000	13,190,955
Deposits	62,932,000	62,778,993
Loans	73,387,000	62,904,763

thing. The constitution prohibits the State forming a bank or even holding stock in one. The condition of the various banks in 1914 is shown on page 99.

Government. The constitution adopted in 1870 has not been amended in any important particulars. Amendments which may be proposed in either house must be passed by two consecutive assemblies and submitted to the people for approval. The Legislature, however, may not propose amendments to the constitution oftener than once every six years, but it may at any time submit to the people the question of calling a convention to alter, reform, or abolish the constitution.

Legislative.—The legislative authority is vested in a general assembly, consisting of the Senate and House of Representatives, members of which hold office for two years. The membership of the House of Representatives must never exceed 99. Senators are proportioned among the counties and districts and must not exceed one-third the number of Representatives.

Executive.—The supreme executive power is vested in the Governor, elected for two years, who must be 30 years of age, and a resident of the State seven years before his election. The Secretary of State is appointed by joint vote of the General Assembly and commissioned for a term of four years.

Judiciary.—The judicial power is vested in a supreme court, and a circuit court, chancery, and other inferior courts. The Supreme Court consists of five judges, of whom not more than two may reside in any one of the grand divisions, and who are elected by the qualified voters. Candidates must be 35 years of age and must have been residents of the State for five years. The term of service is eight years.

Suffrage and Elections.—Every male citizen 21 years of age or over, who has been a resident of the State for 12 months and of the county for six months, is entitled to vote. A State board of elections has general charge of conducting all elections. In all counties of 50,000 inhabitants and over, and in all civil districts of 2500 inhabitants or over, registration is an essential for voting. General registrations are held every two years. A corrupt practices act was passed in 1907.

Local and Municipal Government.—The unit of local government is the county. County officers are coroner and ranger. New counties may be established by the Legislature to consist of not less than 275 square miles, with a population of at least 700 qualified voters. Cities and towns are permitted to adopt a commission form of government. In 1916 the cities of Chattanooga, Knoxville, Memphis, Nashville, Bristol, Jackson, Lafolette, Lebanon, Murfreesboro, and Springfield had adopted this form of civic administration.

Miscellaneous Statutory and Constitutional Provisions.—The Legislature has no power to grant divorces, but may authorize the courts of justice to grant them. Intermarriage between whites and negroes is forbidden. No person shall at any time be required to perform any duties in the State on any day set apart by his religion as a day of rest. Gambling on horse races is prohibited. The State is under prohibition. See *History.*

Finances. The history of the public debt constitutes the most important and interesting part of the financial history of the State. The first debt was created in 1832 and 1838 for the purpose of establishing State banks. Between 1840 and 1850 the State inaugurated the system of public improvements. Bonds were issued to turnpike and railroad companies for construction, and first mortgages were the usual guarantees. In 1861 the total amount of bonds outstanding was over $18,000,000, and a war loan of $3,000,000 was added. The four years of the Civil War destroyed the sources of State income, made payment of interest impossible, and swelled the total indebtedness considerably. In 1865 it rose to $25,277,406, out of which $5,169,740 was interest overdue. The current interest charges alone amounted to $1,185,048, while the revenue was far below it, taxation inadequate, and the amount actually collected considerably less than the sum assessed. Most of the companies to which the bonds were issued failed to pay the interest. The carpet-bag régime that followed the Civil War did not improve matters. New bonds to the amount of $3,408,000 were issued to 14 railroad companies in 1868, interest remained unpaid, and in 1869 the total debt reached $39,896,504. Measures of relief were then passed by the Legislature; sale of the delinquent roads was authorized, and the solvent railroads were permitted to pay their debts in State bonds which were below par. By these means the debt was rapidly reduced to $27,920,386 in 1874. Yet even then the State was unable to meet its obligations. Repudiation began to be talked of towards 1880, and, frightened by this agitation, the bondholders began to offer various plans of settlement. A plan of refunding at 50 per cent was agreed to by the bondholders and the Legislature in 1879, but was rejected by popular vote.

In that year the debt question was the main campaign issue, and the repudiation party lost. A final settlement was reached in 1883, when the State debt proper was scaled down 20–24 per cent and the railroad guarantee bonds 50 per cent. The total debt was reduced by this operation from $28,000,000 to about $15,000,000. The conversion was completed in 1890. On Dec. 20, 1914, the total State debt was $11,752,667. The cash balance on Dec. 20, 1912, was $785,120, the balance on Dec. 20, 1914, was $172,410. The receipts during this period amounted to $9,166,870 and the disbursements to $9,779,579.

Militia. Males of militia age in 1910 numbered 428,088. The organized militia in 1915 included 110 officers and 1703 enlisted men. It consisted of a regiment of infantry, two separate battalions, a separate company of colored troops, a troop of cavalry, and a detachment of sanitary troops, including a field hospital.

Population. The population of Tennessee by periods is as follows: 1790, 35,691; 1810, 261,727; 1830, 681,904; 1850, 1,002,717; 1870, 1,258,520; 1890, 1,767,518; 1900, 2,020,616; 1910, 2,184,789; 1915 (est.), 2,271,379. In 1910 the State ranked seventeenth in the Union, the density per square mile being 52.4. The urban population was 441,045. In that year there were 1,711,432 whites and 473,088 negroes; foreign-born whites formed only 0.8 per cent of the total. By sex the population was divided into 1,103,491 males and 1,081,298 females. Of the native population 13.5 were born outside of the State, most of whom came from Mississippi. The males of voting age numbered 552,668 in 1910. Memphis is the largest city; its population in 1910 was 141,105 and in 1915 (est.) 146,113. Other cities with their populations in 1910 and as estimated for 1915 are Nashville, 110,364 and 115,978; Chattanooga, 44,604 and 58,576; Knoxville, 36,346 and 38,300; Jackson, 15,779 and 17,669.

Education. In 1910 the percentage of illiteracy in the population ten years of age and over was 13.6 per cent. The total number of illiterates in 1910 was 221,071. Among native whites of native parentage the percentage of illiteracy was 9.7 in 1910, among negroes it was 27.3. Of the school population 563,158 were native whites, 10,099 were foreign-born whites, and 163,397 were negroes. The report of the State Superintendent of Education for 1914 shows that on June 30 of that year the school population of the State was 776,895. The total enrollment in the public schools on the same date was 593,437. The total expenditure for schools during the year was $6,064,353. The total enrollment of white children in 1914 was 468,106 and of colored children 115,381. The average daily attendance of whites was 346,676 and of colored children 83,077. There were in the State, in 1914, 134 high schools, in which were 492 teachers. The pupils in these schools were 9950, with an average daily attendance of 7400. Legislation aiming to bring about the consolidation of schools has been in force since 1912. There is a compulsory educational law. A uniform examination law for teachers was put into effect in 1914. Industrial work in high schools and in elementary schools in some instances has been inaugurated with satisfactory results. Several counties employ supervisors for rural schools. Preferential schools have also been established in several counties. State institutes are held each year for white and colored persons.

There are four normal schools in the State: the East Tennessee State Normal School at Johnson City, the Middle Tennessee State Normal School at Murfreesboro, the West Tennessee State Normal School at Memphis, and the Agricultural and Industrial State Normal School for colored pupils at Nashville. There are a large number of institutions of collegiate rank. The most important of these are the University of Tennessee, which is a part of the State system of education, situated at Knoxville, the University of Chattanooga at Chattanooga, Lincoln Memorial University at Cumberland Gap, Cumberland University at Lebanon, Maryville College at Maryville, Vanderbilt University at Nashville, Burritt College at Spencer, Milligan College at Milligan, and Carson and Newman at Jefferson City. These are all coeducational. Colleges for men only are King College at Bristol, Southwestern Presbyterian University at Clarksville, Christian Brothers College (Roman Catholic) at Memphis, and the University of the South at Sewanee. Colleges for women are Sullins College at Bristol, Howard College for Young Ladies at Gallatin, Memphis Conference Female Institute at Jackson, Tennessee College at Murfreesboro, Ward-Belmont College for Young Women at Nashville, Boscobel College at Nashville, Synodical College for Females at Rogersville. Colleges for negroes are Knoxville College at Knoxville, Fisk University at Nashville, and Waldon University at Nashville.

Charities and Corrections. Charitable and correctional institutions under the control of the Board of State Charities include the Eastern Hospital for the Insane and the Tennessee Deaf and Dumb School at Knoxville, Western Hospital for the Insane at Bolivar, the Central Hospital for the Insane, the Tennessee Reformatory, the Tennessee Industrial School, Tennessee School for the Blind, and the two State prisons, all at Nashville, and a branch prison at Petros.

History. Probably De Soto (q.v.) reached the Mississippi at the present site of Memphis in 1541. La Salle, about 1682, built a fort at this point, and called it Fort Prud'homme. The place was again occupied by the French in 1714. The grant by Charles II to the Lords Proprietors of Carolina of the territory between lat. 29° and 36° 30′ N. in 1665 included this territory. (See NORTH CAROLINA.) The first English settlement was Fort Loudon, built in 1756, at the suggestion of Governor Loudon of Virginia, and garrisoned by royal troops, but afterward captured by the Cherokees. Before this, however, Dr. Thomas Walker with a party of Virginians had named the Cumberland River and Mountains, and Daniel Boone (q.v.) and others had entered the wilderness, then regarded as a common hunting ground by the Cherokees, Creeks, Miamis, Choctaws, and Chickasaws. In 1768 the Iroquois, who claimed sovereignty by conquest, ceded their claim to the English, and in 1769 William Bean's cabin on the Watauga marked the first settlement. James Robertson (q.v.) and others came in 1770, another settlement was made near Rogersville in 1771, and soon after Jacob Brown opened a store on the Nolichucky. After the defeat of the Regulators (q.v.) in North Carolina a number of settlers came, supposing the territory to be Virginia soil. When the territory was found to be within North Carolina, the inhabitants of the first two settlements met in 1772 and formed the Watauga Association (q.v.), which served as a form of government for several years. In 1775 Col. Richard Henderson (q.v.) bought from the Indians the territory between the Cumberland and the Kentucky rivers. More settlers came in 1778–79 and in 1780 a compact of government was drawn up at Nashborough, by Colonel Henderson, who had been Chief Justice of North Carolina, and James Robertson, who had been one of the signers of the Watauga Association. These two compacts were much alike and served their purpose excellently.

The Watauga settlers in 1775 or 1776 gave the name Washington District to their colony, and in 1776 it was annexed to North Carolina, though some had dreamed of a separate State. The number of settlers increased rapidly, and nearly 500 men under John Sevier (q.v.) and Isaac Shelby (q.v.) went across the mountains and took part in the attack on the British under Ferguson, at King's Mountain (q.v.), in 1780. All this time the settlers were harassed by severe Indian wars. In 1784 North Carolina ceded to the general government all the territory of the present State on condition that the cession be accepted within two years, but retained until that time full sovereignty. The inhabitants, indignant at being transferred without their consent, and thinking that they had been abandoned, elected delegates from each military company, who met at Jonesboro, Aug. 23, 1784, and formed the State of Franklin, or Frankland; John Sevier was chosen Governor. Congress ignored the request to be recognized as a State and North Carolina promptly repealed the act of cession and asserted its jurisdiction. Civil war was averted by the tact of the North Carolina governors. Confusion, however, reigned, as there were two bodies of officers, and many settlers neglected to pay taxes to either, though furs, skins, and other articles were made legal tender by the infant State. At the expiration of Sevier's term in 1788 the State of Franklin ended. In this attempt at statehood the Cumberland settlers did not join. Davidson County was laid out in 1783 and the Davidson Academy (now the University of Nashville) was founded in 1785. Indian troubles threatened the life of the settlement, and the intrigues of the Spaniards, who still held Louisiana and the Mississippi, made the position more difficult. See MCGILLIVRAY, ALEXANDER.

In February, 1790, North Carolina again ceded the territory to the general government, stipulating that all the advantages of the Ordinance of 1787 (q.v.) should be preserved to the inhabitants, except that slavery should not be prohibited. The act of government for the territory south of the Ohio was passed in April, 1790, and the seat of government was moved from Rogersville to Knoxville. The Indians were severely punished in 1794 and the Spanish influence was broken. In the same year the first territorial assembly met. In 1795, as the territory was found to contain more than 60,000 white inhabitants, a constitutional convention was called, which met in January, 1796. A constitution for the State of Tennessee modeled after that of North Carolina was adopted without submission to popular vote; the first General Assembly met March 28, and the State was admitted June 1, 1796. Almost from the date of admission there was a sharp distinction between East and Middle (West) Tennessee, which was recognized in the appointment of the judiciary. In wealth and material progress the mountainous eastern part lagged. The western part of the State began to fill up after 1818, Memphis was laid out in 1819, and three sections came now to be recognized in law. The State's progress was rapid, though growth was almost entirely along agricultural lines. Construction of internal improvements began early. Turnpike roads were built in 1804, and after 1823 roads and canals were pushed forward. The first railroad was chartered in 1831, but the Memphis and Charleston road was not built until 1857. Much State aid was voted the railroads, and the redemption of the bonds issued for this was a political issue as late as 1882. The eastern part of the State did not share equally in these benefits.

There was a strong Union party in Tennessee at the outbreak of the Civil War, and in February, 1861, the people refused to hold a convention to consider secession, but with President Lincoln's call for troops sentiment changed, and through the influence of Governor Harris the State declared itself by popular vote out of the Union, June 8, though East Tennessee had voted against secession more than two to one. On June 17 a Union convention of delegates from the eastern counties and a few middle counties met at Greeneville and petitioned to be allowed to form a separate State. The request was ignored by the Legislature, and the presence of a Confederate army prevented further action on the part of the Unionists. During the war the State furnished about 115,000 soldiers to the Confederate cause and 31,092 to the Federal army. When the advance of Federal troops drove Governor Harris from Nashville, Andrew Johnson (q.v.), who had refused to resign his seat in the United States Senate on the secession of the State, was appointed military governor. He attempted to reorganize the State in 1864, and set up Lincoln electors, who were rejected by Congress. In 1865 the radical Legislature proceeded to extreme measures. Suffrage was extended to negroes under the Constitution of 1834, which gave that right to every freeman. The State was readmitted July 23, 1866, but there was much disorder. The Ku-Klux Klan (q.v.) appeared, and in 1869 nine counties in Middle and West Tennessee were declared under martial law. For a time after the war the recovery of the State was slow, but more recent development has been exceedingly rapid. The principal events have been the conflicts between convict and free labor in the mines in 1891–93, and the Tennessee Centennial Exposition (q.v.), held at Nashville in 1897.

The vote for President in 1908 was Bryan, 135,819; Taft, 118,519; for Governor, Patterson, Democrat, 113,913; G. M. Tillman, Republican, 113,033. A State-wide prohibition bill was passed over the Governor's veto in 1909, and the same Legislature enacted measures prohibiting the manufacture of intoxicants within the State after Jan. 1, 1910.

Opposition to Governor Patterson divided his party with the result that the governorship went to the Republicans in the election of 1910. Captain B. W. Hooper defeated Robert L. Taylor by a vote of 133,999 to 121,674. Governor Hooper was reëlected in 1912, defeating Benton McMillin. In the presidential election of that year Wilson received 135,399 votes, Taft, 60,674, and Roosevelt, 53,986. The Democrats regained their strength and in the election of 1914 Thomas C. Rye defeated Governor Hooper by a vote of 136,816 to 115,821.

In the presidential elections Tennessee chose Democratic-Republican electors from 1796 to 1824. In 1828 and again in 1832 the only issue was Jackson, and the voters were almost unanimous for him. In 1836, however, Hugh Lawson White, the States-Rights Democrat, was successful in spite of Jackson's efforts. From 1840 to 1852 Whig electors were chosen, Clay receiving the vote in 1844, though Polk was a resident of the State. In 1856 the vote was cast for Buchanan. The constitutional Union ticket headed by John Bell was successful in 1860. The State voted for Grant in 1868. The State has been consistently Democratic since then, with the exceptions of 1880 and 1910 when Republican governors were elected. From the State have come many men of national reputation, including three Presidents, Jackson, Polk, and Johnson.

GOVERNORS OF TENNESSEE

STATE OF FRANKLIN

John Sevier	1785–88

TERRITORY SOUTH OF THE OHIO

William Blount	1790–96

STATE OF TENNESSEE

John Sevier	Democratic-Republican	1796–1801
Archibald Roan	" "	1801–03
John Sevier	" "	1803–09
Willie Blount	" "	1809–15
Joseph McMinn	" "	1815–21
William Carroll	" "	1821–27
Sam Houston	" "	1827–29
William Hall (acting)		1829
William Carroll	Democrat	1829–35
Newton Cannon	States-Rights Democrat	1835–39
James K. Polk	Democrat	1839–41
James C. Jones	Whig	1841–45

GOVERNORS OF TENNESSEE—*Continued*

Aaron V. Brown	Democrat	1845–47
Neil S. Brown	Whig	1847–49
William Trousdale	Democrat	1849–51
William B. Campbell	Whig	1851–53
Andrew Johnson	Democrat	1853–57
Isham G. Harris	“	1857–62
Andrew Johnson	Military	1862–65
Interregnum		4th March, 5th April, 1865
William G. Brownlow	Republican	1865–69
DeWitt C. Senter	Conservative-Republican	1869–71
John C. Brown	Democrat	1871–75
James D. Porter	“	1875–79
Albert S. Marks	“	1879–81
Alvin Hawkins	Republican	1881–83
William B. Bate	Democrat	1883–87
Robert L. Taylor	“	1887–91
John P. Buchanan	“	1891–93
Peter Turney	“	1893–97
Robert L. Taylor	“	1897–99
Benton McMillin	“	1899–1903
James B. Frazier	“	1903–05
John I. Cox	“	1905–07
Malcolm R. Patterson	“	1907–11
Ben W. Hooper	Republican	1911–15
Thomas C. Rye	Democrat	1915–

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TENNESSEE, THE. A formidable Confederate ram crippled by the *Hartford* of Admiral Farragut's fleet, and taken in Mobile Bay on Aug. 5, 1864.

TENNESSEE, UNIVERSITY OF. A coeducational State institution, founded in 1794 as Blount College. Its title was changed in 1807 to East Tennessee College, in 1840 to East Tennessee University, and in 1879 to its present name. The institution comprises a graduate department, a college of liberal arts, a college of engineering, a college of agriculture, a college of law, a school of commerce, and a school of education, all located at Knoxville; and a college of medicine, a college of dentistry, and a school of pharmacy, located at Memphis. There are the usual four-year courses in arts, engineering, agriculture, commerce, medicine, etc. In addition to these there is a three years' course in law and one in dentistry, and two years' courses in agriculture, pharmacy, and preliminary to medicine. Short courses are offered to farmers, extending through six weeks in the winter. The Summer School of the South is conducted at the University of Tennessee. It has very successful sessions, the attendance generally reaching nearly two thousand, this number having been several times exceeded. The University has a liberal system of accrediting schools, whose certificates are accepted in place of the usual entrance examinations. Tuition in liberal arts, engineering, agriculture, commerce, and education is free to Tennesseans. The attendance in 1916 was about 1200, and the faculty numbered over 200. The library contained about 40,000 volumes. The endowment was about $425,000, and the income about $250,000. The grounds and buildings are valued at more than $1,000,000. The President in 1916 was Brown Ayres, Ph.D., LL.D., D.C.L., who was elected in 1904.

TENNESSEE CENTENNIAL EXPOSITION. An exposition held in Nashville, Tenn., May 1 to Oct. 30, 1897, to celebrate the one hundredth anniversary of the admission of the State into the Union. The site covered about 200 acres, and a characteristic feature of the landscape plan was the sward planted with the famous blue grass of the region. The buildings, of which there were over a hundred, included those devoted to agriculture, commerce, education, fine arts, history, machinery, minerals and forestry, and transportation, as well as those in which the special exhibits pertaining to children, negroes, the United States government, and women were shown. The total attendance was 1,786,714, of which the total paid attendance was 1,166,692. The total receipts were $1,101,285, and the disbursements $1,101,246. Consult Justi, *Official History of the Tennessee Centennial Exposition* (Nashville, 1898).

TENNESSEE RIVER. The largest tributary of the Ohio River. It is formed by the confluence of the Holston and the French Broad rivers, about four miles east of Knoxville (Map: Tennessee, F 3). Thence it flows southwestward, enters into Alabama about 40 miles below Chattanooga, Tenn., and after crossing the northern part of Alabama again enters Tennessee in Harding County, whence it flows northward across Tennessee and Kentucky, and enters the Ohio at Paducah, about 40 miles above Cairo. Including the Holston, its length is about 1200 miles. Its drainage basin includes about 39,000 square miles. A canal having been constructed (1889) around the Muscle Shoals, between Florence and Decatur, Ala., the main stream is now navigable for 673 miles from its mouth. Its chief affluents are the Clinch, Hiawassee, Sequatchie, Elk, and Duck rivers. The river takes its name from the old Cherokee Indian town, Tennassee, which stood near the present town of Lenoirs, Tenn.

TENNIEL, tĕn′yel, SIR JOHN (1820–1914). An English cartoonist and illustrator. He was born in London, and was practically self-taught. In 1845 he won a prize in the competition for the decoration of Westminster Palace, with a cartoon, "Allegory of Justice," the success of which also secured for him the commission to paint a fresco, Dryden's "Saint Cecilia," in the House of Lords, but he soon devoted his time entirely to work in black and white, upon which his success rests. From 1851 to 1901 he was cartoonist for *Punch*, executing about 2300 cartoons, and also innumerable small drawings and designs for Punch's *Almanac* and Punch's *Pocket-books*. His work is characterized by correct draftsmanship, and by originality and freshness of invention, combined with dignity of conception. His satire is genial, and the statuesque beauty of his ideal subjects shows German influence. He was knighted in 1893. Among his principal book illustrations are those for *Æsop's Fables* (1848); Moore's *Lalla Rookh* (1861); Lewis Carroll's *Alice's Adventures in Wonderland* (1866) and its sequel, *Through the Looking Glass* (1870); the *Ingoldsby Legends;* and his classical illustrations to the *Legendary Ballads*. In collaboration he illustrated: *Poets of the Nineteenth Century* (1857); *Poe's Works* (1859); the *Arabian Nights* (1863); *Legends and Lyrics* (1865).

TENNIS. A game played with racquet and ball in a covered court, inclosed by four walls. A net with each end higher than the middle is stretched across the court midway between the end walls. The divisions made by the net are termed the "service side" and the "hazard side." Points of vantage reserved for the spectators include the "dedans," an opening, covered with netting, in the wall at the service end. The main wall (on the right of the service side) is clear, with the exception of a buttress (called the "tambour") on the hazard side. The other three walls have penthouses, whose roofs slope downward. The walls should be 30 feet high, the length of the court about 94 feet, and its width about 31 feet at the dedans wall and about 30 feet at the grille wall, exclusive of the penthouses. The racquets used are strong and heavy, with long handles, large face, and a bulging side. The interior of the ball is of cloth and it is therefore heavier, though of the size and of the same color as the lawn-tennis ball.

The play is too complicated to be described here in detail, but in a general way it may be explained that, to be fairly served, the ball must be struck from the service court directly onto the roof of the left penthouse, or to the wall above it, and must then rebound into the hazard side in the court bounded by the pass line and the winning (last) gallery; otherwise it is a pass or a foul. If the ball goes to the grille side of the pass line the play is termed a "pass." Unless a pass has occurred, the striker-out may volley a service, provided the ball has not touched the penthouse on the grille side, and if there is no danger of injuring the server. The serve is counted as in lawn tennis (q.v.). Consult *Court Games*, edited by F. R. Toombs, in "Spalding's Athletic Library" (ib., issued annually), and "Tennis," in the *Encyclopædia of Sport* (London, 1911).

TENNIS ELBOW. See NEUROSIS.

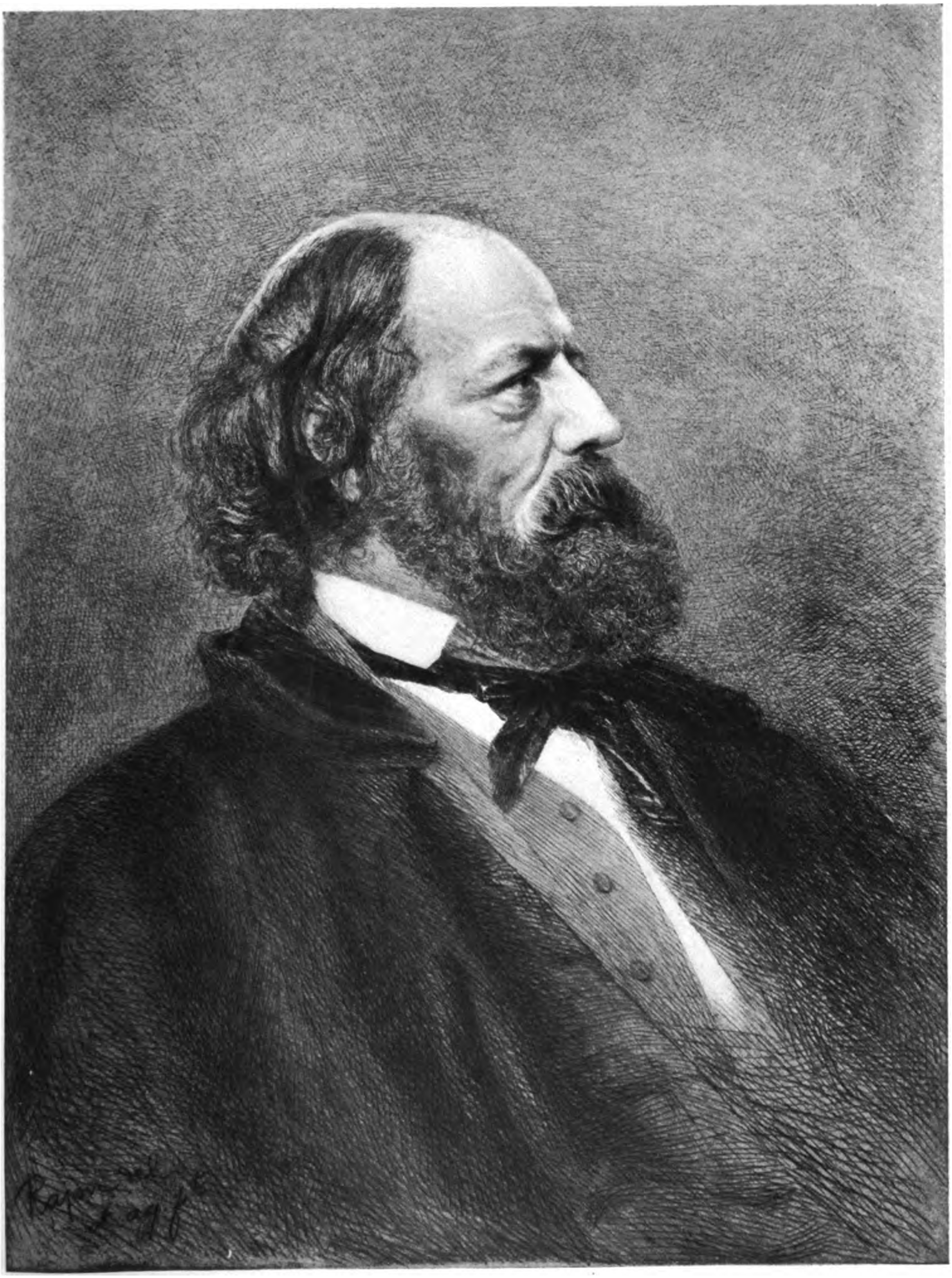
TENNO, JIMMU. See JIMMU TENNO.

TEN'NYSON, ALFRED, first BARON TENNYSON (1809–92). The most representative English poet of Victoria's reign. He was born on August 6, 1809, at Somersby, in Lincolnshire, a village of which his father was rector. Two of his brothers also displayed no slight poetic gifts, Frederick (q.v.), and Charles, afterward known as Charles Tennyson Turner (q.v.). Alfred spent four years (1816–20) at the grammar school of Louth, a few miles from his home, and for the next eight years his education was directed by his father, a man of some literary talent. He roamed the country round, delighting in the rural charm of the neighborhood, and laying the foundations of that full and minute knowledge of nature for which his verse is conspicuous, read extensively, and tried his hand in the manner of Pope, Thomson, Scott, Moore, and Byron. Fragments of this early work found their way into *Poems by Two Brothers* (1827; reprinted 1893), written in conjunction with his brother Charles. In 1828 the two brothers entered Trinity College, Cambridge, to which Frederick had gone a year earlier. At the university Tennyson was associated with a remarkable group of young men, most of whom formed the famous society known as The Apostles. To this group belonged Thackeray, Spedding, Trench, Monckton Milnes, afterward Lord Houghton, Merivale, Alford, and Arthur Henry Hallam, son of the historian, who discerned his friend's genius and in 1829 told Gladstone that Tennyson "promised fair to be the greatest poet of our generation, perhaps of our century."

In that same year, with *Timbuctoo*, a poem in blank verse, Tennyson won the Chancellor's gold medal, and while still in residence published the epoch-making volume of *Poems, Chiefly Lyrical*. In 1830, when the slim little book appeared, poetry seemed to be dead, and the novel, under the impulse of the unprecedented success of the *Waverley* series, held the field. Showing the influence of Coleridge and Keats, the poems in this volume were by no means essentially imitative; rather, they contain in germ nearly all of Tennyson's great original qualities. In the same year he traveled in the Pyrenees with Hallam, and there, in the valley of Cauterets, he wrote parts of "Œnone."

He left Cambridge without a degree in February, 1831, for various reasons, but chiefly the ill health of his father, who died a few weeks later. The family, however, remained at Somersby for six years longer. The second volume of *Poems* (1833) contained many of his choicest minor pieces: "The Lady of Shalott," "The Miller's Daughter," "The Palace of Art," "The Lotos-Eaters," and "A Dream of Fair Women." Except by his friends, the collection was not well received; Lockhart wrote an especially brutal review in the *Quarterly* for April. In September a lifelong sorrow fell upon the poet in the death of Hallam, his dearest friend, who was engaged to his sister Emily. For ten years he remained silent, reading largely, revising old poems, and writing new ones. By 1836 he had definitely given his heart to his future wife, Emily Sarah Sellwood, the sister of his brother Charles's wife. But, though deficiency of income seemed an insuperable bar to marriage, and though her relatives forbade even correspondence, Tennyson had no thought of deserting the art to which his life belonged to take up a profession more lucrative.

In 1842 he gained his public with *Poems* in two volumes, representing a wide range of theme and metrical structure. Here first appeared "Morte d'Arthur," the first sketch of the *Idylls of the King;* "Ulysses," "Locksley Hall," "Godiva," "Break, break, break," and "The Two Voices." Tennyson's place in English poetry was now secure; but fortune seemed far off. His capital was shattered by a strange investment in wood-carving machinery; and in 1845 Peel was moved by Lord Houghton to grant him a civil-list pension of £200. In 1847 appeared *The Princess*, a romantic medley in musical blank verse, marked by his "curious felicity" of style, and containing, in its third (1850) edition, some wonderful lyrics. The year 1850 has been called his *annus mirabilis*. In June he published *In Memoriam*, a tribute to the memory of Arthur Hallam. At first not well understood, it has now definitely taken its place with *Lycidas, Adonais*, and *Thyrsis* among the great English elegies. In the same month he married Miss



TENNYSON
FROM AN ETCHING BY PAUL RAJON

Sellwood (with whom, he said afterward, "the peace of God came into my life"); and in November he was appointed poet laureate, succeeding Wordsworth. He settled with his bride at Twickenham, where he lived until (in 1853) he leased and shortly afterward purchased the estate of Farringford, near Freshwater, in the Isle of Wight, where he was wont to live for a part at least of each year for the rest of his life. After 1870 he divided his time between Farringford and Aldworth, a house which he built on Blackdown Hill, near Haslemere.

In 1855 appeared *Maud, and Other Poems.* "Maud," a great favorite with Tennyson, puzzled the critics, who tried to find in it the result of the author's own experience, though it is rather a vivid dramatic conception, rare with Tennyson. "No modern poem," said Jowett, "contains more lines that ring in the ears of men." The same volume contained the popular "Brook" and "The Charge of the Light Brigade." Returning to Arthurian legend, Tennyson published in 1859 four of the *Idylls of the King;* others were added in 1869, and in 1872 they were arranged in sequence, with a completion in "Balin and Balan" (1885). Though his conception of the Arthurian romances has been severely criticized, and though it must be confessed that his favorite heroes have here something of the aspect of carpet knights, the *Idylls* still remain on the whole a fine achievement and in scattered passages quite above criticism. *Enoch Arden* (1864) was the most immediately popular of all his volumes; sixty thousand copies were sold, and the title poem was translated into eight languages. From the epic Tennyson turned to the drama, producing *Queen Mary* (1875), *Harold* (1876), and *Becket* (1844). Besides these imposing historical pieces are *The Falcon* (1884), *The Cup* (1884), *The Promise of May* (1886), and *The Foresters* (1892), of which *The Cup* was the most successful as an acting play. Tennyson's productive imagination continued active throughout his last years. His last volumes were *Ballads and Other Poems* (1880), containing "Rizpah" and "The Northern Cobbler"; *Tiresias and Other Poems* (1885); *Demeter and Other Poems* (1889), containing "Crossing the Bar"; and the posthumous *Death of Œnone and Other Poems* (1892).

In 1884, after some hesitation, the poet accepted a peerage. He died at Aldworth, Oct. 6, 1892, and was buried in Westminster Abbey.

No English poet has produced masterpieces in so many different kinds as Tennyson; he is the representative figure in literature of the Victorian era, because he touched and reconciled a greater number of its diverse interests than any other writer. Yet he is in constant protest against the individualism which that period inherited from the Romantic revival. The most salient feature of his mental attitude is his sense of law; it is the "reign of law" as shown by modern science which most attracts him to scientific subjects. The consummate artistic excellence of his verse, resembling in many of its qualities that of Vergil, gives him an abiding place in literature. No better example exists in English of the eclectic style made up of elements inherited from many of his great predecessors, emulating "by turns the sweet felicity of Keats, the tender simplicity of Wordsworth, the straightforward vigor of Burns, the elusive melody and dreamlike magic of Coleridge, the stormy sweep of Byron, the large majesty of Milton"; and he expressed, with such an instrument, a teaching which was uniformly pure, noble, and consoling.

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TENNYSON, CHARLES. See TURNER, CHARLES TENNYSON.

TENNYSON, FREDERICK (1807–98). An English poet, brother of Alfred Tennyson (q.v.), born at Louth, in Lincolnshire. In 1827 he left Eton, as captain of the school, and went up to

Trinity College, Cambridge, where he graduated in 1832. He passed most of his time for many years on the Continent, living for a long period at Florence. In 1859 he settled in the Isle of Jersey, where he remained until 1896. He then removed to Kensington, where he died. With his brothers, Alfred and Charles, Frederick wrote verse before his college days. To their *Poems by Two Brothers* (1827) he contributed four poems. In 1854 he published *Days and Hours*, which contained several beautiful and noble lyrics. In 1890 appeared *The Isles of Greece;* in 1891, *Daphne and Other Poems;* and *Poems of the Day and Year* (1895). His *Shorter Poems*, with an introduction by Charles B. L. Tennyson, were collected in 1913. Alfred Tennyson said that his brother's poems "were organ-tones echoing among the mountains."

TENNYSON, Hallam, second Baron Tennyson (1852–). Eldest son of the poet, Alfred, Lord Tennyson (q.v.). He was born at Twickenham, was educated at Marlborough College, and at Trinity College, Cambridge, and studied law at the Inner Temple, after which he was for some years his father's private secretary. To the *Contemporary Review* for November, 1876, he contributed a translation of the old English song of *Brunanburh*, which was afterward turned into verse by his father. In 1880 he edited, with an introduction, the sonnets and lyrics of his uncle Charles Tennyson Turner (q.v.); and in 1897 he published the authorized life of his father, under the title *Alfred, Lord Tennyson: A Memoir*. Governor of South Australia from 1899 to 1902, he was then Governor-General of the Commonwealth of Australia for two years. He received the G.C.M.G. and honorary degrees from Oxford and Cambridge. In 1908 he brought out the Eversley edition of his father's complete works, which contained notes by his father and by himself; and in 1912 appeared *Tennyson and his Friends*, edited by him, a work abounding in personal anecdote and literary reminiscence.

TENOCHTITLAN, tā-nŏch′tēt-lăn′. The ancient capital of the Aztecs, occupying the site of the present city of Mexico (q.v.).

TENOR (OF. *tenour*, *teneur*, from ML. *tenor*, chief melody, highest male voice to which this was assigned, Lat. *tenor*, a holding, tone, accent, from *tenere*, to hold, retain). In music, one of the classes into which voices are divided in respect to their compass. It is the highest adult male voice, with an approximate range from c to a^1. Music for tenor voices is generally written in the treble clef, or an octave higher than its true pitch. The sign of the C clef is also often used, but it is not placed on the second *line*, but second *space*, so that the music is read as in the treble clef, but an octave lower. Two classes of tenors can be recognized, the heroic and lyric tenors (*tenore robusto*, *tenore di grazia*). The heroic tenors have something of the sonorous quality of the barytone in the lower register.

TE′NOS, or **TINOS,** tē′nŏs. An island in the Ægean Sea belonging to the Cyclades (q.v.) and known as one of the most productive in the group (Map: Greece, G 6). It has an uneven surface and covers an area of 79 square miles. On the south coast is the little town of the same name, called also Hagios Nikolaos (St. Nicholas). It is on the site of the ancient town of Tenos, the remains of whose temple of Poseidon were laid bare in 1902. The chief industries are wine making and marble quarrying. Corn grows in abundance and fig exportation is important. Pop., 1906, 12,300. Tenos played an active part in the struggle between the Greeks and Persians, as well as in the Greek revolution of 1821–27.

TENOT′OMY (from Gk. *τένων*, *tenōn*, tendon, from *τείνειν*, *teinein*, to stretch, strain + *τομή*, *tomē*, a cutting, from *τέμνειν*, *temnein*, to cut). The division of a tendon; a surgical procedure which usually has for its object the relief of some variety of deformity by severing a permanently contracted muscle at its tendinous portion. The affections in which tenotomy is most frequently found useful are clubfoot (q.v.), contractions of the extremities following paralysis, deformity from contraction of the palmar fascia, wryneck (q.v.), ankylosis of the joints, and strabismus (q.v.).

TEN PERSECUTIONS OF THE CHRISTIANS. See Persecutions of the Christians, The Ten.

TEN′REC (Malagasy name). An insectivore of the African family Centetidæ. Of the seven genera and many species, the best known is the tenrec (also spelled tendrac and tanrec), which is about a foot long, and owes its specific name (*Centetes ecaudatus*) to having no tail. Its hairs are rather spiny, but actual spines appear only in the young, which have three lines of them along the back, shed at the time of the arrival of the permanent teeth. The tenrecs are nocturnal animals, natives of Madagascar and the Mascarene isles. Three other species exist. They feed mainly on earthworms, æstivate during the hot season, and produce many young, sometimes more than 20. The flesh is edible, and the animal is so useful in the destruction of worms and insects that it has been introduced into Mauritius and Bourbon. See Plate of Porcupines and Hedgehogs.

TENSA. See Tænsa.

TENSE. In grammar (q.v.), the change in the form of a verb which marks the time of the action. See Conjugation; Verb; Grammar; Philology, *Syntax*.

TENSKWATAWA, tĕn-skwä′tȧ-wȧ, or **ELKSWATAWA,** ĕlk-swä′tȧ-wȧ (the open door) (c.1775–1834). A Shawnee prophet, younger brother of Tecumseh (q.v.). He attracted no special notice in his tribe until November, 1805, when, at the ancient town of Wapakoneta, in what is now northwestern Ohio, he made public proclamation of a vision during a recent trance, in which he claimed to have been taken up to the spirit world and to have received there a revelation from the God of the Indians, by which they were commanded to return to their primitive condition and customs. In a short time his followers were numbered by the thousands throughout the region of the Ohio valley and the upper lakes. He was believed to be the living incarnation of Manabozho (q.v.), the great culture god of the Algonquian race. In the spring of 1808 he removed, together with his brother, from Greenville, Ohio, to a more central location on the Wabash just below the entrance of the Tippecanoe, the new settlement being familiarly known as Prophet's Town. Here the prophet continued to preach, but the battle of Tippecanoe, Nov. 7, 1811, broke his power and prestige. His followers scattered to their tribes until again summoned to battle by the English. Everywhere denounced as a liar and deceiver, he finally found refuge with the Wyandot. On the outbreak of the War of 1812 he crossed over into Canada, but returned when peace was declared and rejoined his tribe in Ohio, removing with them to the West in 1827.

TENSON. See Tenzon.

TENT. A portable structure of canvas, skin, or other fabrics, designed for shelter. Animal skins and foliage doubtless formed the earliest coverings, for which textile fabrics have been substituted. In the Book of Genesis the patriarchs are represented as dwelling in tents, probably the same as the modern Arab tents, large rude structures, low, but covering a considerable space of ground. The early Greek and Macedonian military tents were small coverings of skin, each tent sheltering two soldiers. The Romans used two sorts of tents, one of canvas, constructed with two upright poles and a ridgepole between, similar to the camping tent of to-day; the other resembling a light hut—a wooden skeleton, covered by bark, hides, thatch, or other material affording warmth or protection. This latter type, it may be presumed, was only employed in the winter or for more permanent camps. Each tent sheltered ten soldiers with their *decanus*. Possibly the tent has reached its highest perfection in Persia, where there are many tribes who dwell in tents. They are nearly hemispherical, over a wooden framework, and covered with felt, with worked hangings covering the entrance. The Chinese lower classes also live much in tents, and while their construction is invariably of matting, they are usually of great size and comfortable in design. Modern military tents are made of cotton canvas, and latterly, since the adoption of the khaki and olive-drab color and its wide use in military uniforms, tents made in this color have been very largely employed both in England and in America as being cooler than those of white canvas. The largest military tents are those used for hospital purposes. They are oblong in shape, with high side walls. The tent most commonly used in military camps is conical or pyramidal, about 12 feet in diameter and 10 feet high, affording sleeping accommodation to about 16 men. In the United States army five kinds of tents are employed: hospital, wall, A, pyramidal, and shelter. Where possible a fly or outer roof is used over the tent proper. The shelter or "dog tent" is a small, easily carried contrivance which affords a degree of shelter for two men. Whether field troops should be supplied with tents or not is a much discussed question. In a thickly settled country they may not be needed. They are needed, however, under conditions requiring the semipermanent occupation of a sparsely settled region (e.g., the Mexican border, 1914–16). The leading consideration is one of transportation, as the tentage of a modern army would add enormously to the transport facilities needed. See Encampment.

TENTACULITES, tĕn′tăk-ū-lī′tēz (Neo-Lat. nom. pl., from *tentaculum*, tentacle, feeler, from Lat. *tentare*, to touch, test, try). An important genus of fossil shells found in Silurian and Devonian rocks and often so abundant that they constitute the greater portion of thin limestone beds. The shells are of delicate, elongate conic form with the outer surface marked by regular transverse striations of either the same or alternate sizes, and also by very delicate longitudinal lines in the hollow between the striations. The species range from ¼ to 3 inches in length. See Pteropoda.

TENT CATERPILLAR. The larvæ of four species of silk-spinning moths of the genus *Malacosoma* (formerly *Clisiocampa*). The female of the apple-tree tent caterpillar (*Malacosoma americana*), a dull reddish-brown moth with two oblique pale stripes on the fore wings, lays eggs in ringlike masses fastened to small twigs of apple, cherry, thorn, etc. The caterpillars hatch in early spring in the nearest fork of the twigs and spin a web or tent in which they live in company, but which they leave when hungry, to feed upon leaves. The tent is enlarged as the creatures grow. They hibernate in the egg stage. The eggs are easily seen in the winter and may be destroyed and the caterpillars killed just at nightfall within the tents by burning or spraying with kerosene. The so-called forest tent caterpillar, or forest army worm (*Malacosoma disstria*), has similar habits, but the ring of eggs is perfectly cylindrical instead of being rather elliptical as with the former. Both of these species are of Eastern distribution. On the Western coast the larva of *Malacosoma constricta* infests fruit trees in the late summer, and the larva of *Malacosoma californica* is found upon oaks early in the season. An incredible amount of damage is done by these larvæ every year to forest and fruit trees in America.

TEN′TERDEN, Charles Abbott, first Baron (1762–1832). An English lawyer and jurist, born at Canterbury. Abbott graduated at Corpus Christi College, Oxford, in 1785, and soon afterward was made a fellow. After being a student of the Inner Temple he was called to the bar in 1796. He joined the Oxford circuit, and rapidly acquired a lucrative practice. He published, in 1802, his treatise on *Merchant Ships and Seamen*, in all respects the best-written book which had till then appeared on one department of English law and still a standard authority. In 1816 he accepted a puisne judgeship in the Court of Common Pleas; and in 1818 he was knighted, and chosen to succeed Lord Ellenborough as Chief Justice of the King's Bench. He was raised to the peerage in 1827 as Baron Tenterden of Hendon.

TEN THOUSAND, Retreat of the. See Anabasis; Xenophon.

TEN THOUSAND A YEAR. A novel by Samuel Warren (1841).

TENURE (OF., Fr. *tenure*, from Lat. *tenere*, to hold, retain). The manner in which a person holds or owns real property. The word implies something less than an absolute and unqualified ownership. Before the development of the feudal system, an individual could own a piece of land absolutely, and such allegiance as he might owe to a superior power was a personal matter. However, at the very basis of the feudal system were the ideas of protection and service, of the dominion of the King and the dependence and subordination of the subject. Out of these ideas originated the feudal doctrine that the King should own all the land, and that his subjects were only entitled to hold such portions of it as he might parcel out to them, and on such conditions as he might impose. The Anglo-Saxons held their lands allodially, i.e., by absolute and unqualified ownership; but when the Conqueror assumed the throne he parceled out the country to his men as if it were his private estate and introduced the intricate feudal tenures which had grown up on the Continent. See Feudalism.

With respect to their character and dignity, tenures under the feudal system in England may be classified as free and base or nonfree tenures.

The most common of the free tenures was that by knight's service, which involved allegiance, military service, and other duties to the King or overlord. This tenure was created by a solemn ceremony, in which the prospective tenant was said to pay homage to his lord, who thereby became bound to protect him in exchange for his promises of service and fealty. The chief service was performed by actual military duty when necessary, although at a later period a practice of making payments or sending substitutes, instead of the personal service, was sanctioned. Other heavy burdens incident to this tenure were known as reliefs, aids, wardships, and marriage (qq.v.), which yielded a large revenue to the great men of the realm.

Less common, but of greater dignity, was the tenure by grand sergeanty, which involved some personal service to the King, usually something other than military duty, as to be his cupbearer, chief justice, standard bearer, etc. Petty sergeanty did not usually involve personal service, but some tribute, such as rendering to the King annually a weapon or a pair of spurs. See GRAND SERGEANTY.

Lands were frequently conveyed to the clergy on condition that they sing masses for the souls of the poor or distribute alms at certain intervals. This was known as tenure by frankalmoign or free alms. In early times such land also remained subject to the burdens of feudal tenure.

As the rigor of the feudal system relaxed tenure by socage became the common and popular manner of holding land. See SOCAGE.

Gavelkind, borough English, and burgage tenures were merely forms of socage tenure, changed somewhat by local custom. The Statute of Military Tenures in 1640 converted the military tenures into free and common socage.

During the Norman era there existed in England a large class of people known as villeins, who were practically serfs, and were generally attached to the land. They were given small plots to cultivate and were required to perform the most menial services for the lord at his will. This was known as the tenure of villeinage and was a base or nonfree tenure. It became the custom, however, to note the succession of a son to his father, and the character of services performed by the latter, on the rolls or records of the court baron of the manor. By this custom the services required of villeins in each manor assumed a more certain and definite character, and they were said to hold by virtue of a "copy of the rolls of the court." At a later period the payment of rent in some form was substituted for menial services, and the copyhold tenant, as he came to be called, became a respectable member of the community. Many copyhold tenures still prevail, and the old practice of resorting to the "custom of the manor" to ascertain their character or incidents still obtains.

In the United States most of the lands originally granted by the crown and proprietors of plantations were held in free and common socage, and a modified form of this tenure still obtains in a few States. In most of the States, however, all feudal tenures have been abolished and lands are held allodially, i.e., absolutely and subject only to the right of eminent domain in the State.

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TENURE IN CHIVALRY. See CHIVALRY, COURT OF; FEUDALISM; KNIGHT; TENURE.

TENURE OF OFFICE ACT. A measure growing out of the controversy between Congress and President Johnson and passed over his veto on March 2, 1867, providing that the consent of the Senate should be necessary to the dismissal of any officer appointed by and with the advice and consent of that body. Cabinet officials were also included in this. This was a complete reversal of the policy of the government with regard to removals from office, and the President's disregard of the law in removing Secretary E. M. Stanton (q.v.) was the main cause of his impeachment by the House of Representatives. (See IMPEACHMENT; JOHNSON, ANDREW.) With the accession of General Grant to the presidency in 1869 the more objectionable features of the Act were stricken out, and finally, in 1887, the Act as a whole was repealed.

TENU-TERU. See TERU-TERU.

TENZON, tĕn′zon, or TENSON (Prov. *tenso*, from Lat. *tensio*, stretching, contention, from *tendere*, to stretch). In Provençal poetry, a debate in verse between two poets, and hence a special metrical form adopted for the purpose. See PROVENÇAL LITERATURE.

TEOCALLI, tā′ō-käl′yē (Nahuatl, house of the god). The ancient Mexican term for a temple and place of sacrifice and worship. The teocallis were commonly low, truncated, four-sided pyramids of earth, stone, or adobe brick, with a small temple on the flat summit. There was also as a rule a sacrificial stone on the summit, where public sacrifices were made. The term has come to be applied more specifically to the teocalli of the city of Mexico. This famous structure, completed in 1487, was a double pyramid with one temple to the Aztec god of war, Huitzilopochtli, and the other to the god of rain, called Tlaloc. The teocalli was in the Tecpan or temple inclosure, a great ceremonial centre which also contained many smaller temples. Human sacrifice reached the most horrible extreme on the sacrificial stones of this teocalli that it ever reached anywhere in the world. *The Codex Telleriano-Remensis*, an Aztec document, records that 20,000 captives were sacrificed at the dedication ceremonies of the great teocalli.

TE′OS (Lat., from Gk. Τέως). An ancient Ionian city on the west coast of Asia Minor, situate on a peninsula projecting into the Gulf of the Cayster, northwest of Ephesus. Here was a celebrated temple of Dionysus and a theatre, of which remains still exist, while the walls of the modern town of Sigliajik contain many interesting inscribed stones from the ancient site. Teos was prosperous till the Persian conquest, when a large part of its inhabitants withdrew to their colony of Abdera (q.v.) in Thrace. It was the birthplace of the lyric poet Anacreon (q.v.). The place regained some importance in Roman times.

TEOSINTE, tĕ′ō-sĭn′tē (Mexican name), *Euchlæna mexicana*. A tall, spreading, leafy annual closely related to maize or Indian corn. It is a native of the warmer parts of Mexico and Central America, from whence it has been introduced as a forage crop. The plant requires a rich, moist soil and a long, hot season. In its native habitat it grows rapidly, often attaining a height of 10 to 15 feet in a few months. The stalks bear tassels of staminate flowers and a number of small, flattened, poorly filled ears, the grain of which seldom matures farther north than lat. 30°. On account of its extensive tillering (30–50 stalks often springing from a single root) and its very leafy habit, teosinte produces as much green fodder upon a given area as any other grass. The stalks are tender, and the whole plant is readily eaten by stock. The plants may be cut several times during the season, but a single cutting just before the advent of autumn frosts is said to yield about as much forage as the more frequent cuttings. Teosinte grows best in the United States in the region of the Gulf coast. In Texas, where it is grown for green forage and hay, it produces three crops a year and matures seed only in the extreme southern part of the State. An analysis of the green fodder shows it to contain: water, 66.77 per cent; ash, 3.97; protein, 2.54; fibre, 12.33; nitrogen-free extract, 13.60; fat, 0.79. Consult C. V. Piper, *Forage Plants and their Culture* (New York, 1914).

TEOTOCHI, Isabella. See Albrizzi, Countess d'.

TEPARY. See Bean.

TEPEHUAN, tā'pȧ-hwän' (mountaineer, or conqueror). A brave and warlike tribe of Piman stock (q.v.) formerly occupying a considerable territory in the Sierra Madre, south of the Tarumari (q.v.), but now restricted to the mountainous region in the extreme northwestern portion of Durango, with adjoining portions of Chihuahua and Sinaloa, Mexico. In former times they were reputed the bravest people of Mexico, and they are still extremely jealous of their tribal rights. They are an industrious, agricultural people, living in houses of logs or stone set in clay mortar, or frequently utilizing the mountain caves for shelter. They cultivate cotton, which they weave into fabrics of beautiful texture and colors. They are now reduced to a mere remnant.

TEPIC, tȧ-pēk'. A territory in western Mexico (Map: Mexico, F 6, 7). Area, 11,275 square miles. The surface is low on the coast and mountainous toward the eastern frontier. Agriculture is the chief industry, the principal products being wheat, coffee, tobacco, and sugar. Gold, silver, copper, and lead are found. Pop., 1910, 171,173, mostly semi-independent Indians. Capital, Tepic (q.v.). The Nayarit population long resisted the Spanish sway and were not subdued until 1722, and then only nominally. In 1872 they rebelled against the Mexican government, but were subdued after a bloody struggle. The Territory of Tepic was organized in 1889.

TEPIC. The capital of the Territory of Tepic, Mexico, 28 miles east of the port of San Blas, with which it is connected by a railway (Map: Mexico, F 7). Situated on a plateau 3069 feet above the sea, it commands a fine view of the Pacific; its climate, mild and healthful, attracts many summer residents from San Blas. It has cotton and cigar manufactures. Pop., 1910, 16,778. It was founded in 1531 by Nuño de Guzmán.

TEPIDARIUM. See Bath.

TEP'LITZ, or **TÖPLITZ,** tĕp'lĭts. A town of Bohemia, Austria, 46 miles northwest of Prague, in the valley of the Biela, between the Erzgebirge and the Mittelgebirge ranges (Map: Austria, C 1). It is a favorite watering place, famous for its hot springs, which range in temperature from 97° F. to 120° F.; they are almost free from mineral properties and are visited as an aftercure by patients from Marienbad, Carlsbad, etc. The most important building is the castle of Prince Clary, which, with its surrounding park and gardens, constitutes the chief resort of the town. Teplitz has important manufactures of machinery, hardware, buttons, cotton and india-rubber goods, chemicals, glass, pottery, and sugar. The springs have been celebrated since the eighth century. The town is known for the treaty of alliance signed here Sept. 9, 1813, by the monarchs of Russia, Prussia, and Austria against Napoleon. Pop., 1900, 24,117; 1910, 26,775.

TERAI. See Tarai.

TER'AKTOG'ENOS KUR'ZII. A large tree, 40 to 60 feet in height, belonging to the family Bixaceæ. It is most abundant in Chitlagong and Burma, the seeds furnishing the true chaulmoogra oil, instead of *Gynocardia odorata*, as formerly reported. The seeds are marketed largely in Calcutta and are found in two forms, mature brown seeds rich in oil and immature seeds black in color, poor in oil. Chaulmoogra oil has long been used in India for cutaneous diseases, and it has attained some repute in the treatment of rheumatism, scrofula, and leprosy (qq.v.).

TERAMO, tā'rȧ-mô. The capital of the Province of Teramo, Italy, 32 miles northwest of Chieti, at the confluence of the Tordino and Vazzola rivers (Map: Italy, D 3). It lies amid attractive mountain scenery, and has interesting Roman remains. The fourteenth-century cathedral was restored in 1898. The Church of Sant' Agostino is a handsome Gothic structure. Pottery, leather, fine furniture, straw hats, and cream of tartar are manufactured. The Gran Sasso d'Italia is often ascended from here. Pop. (commune), 1901, 24,563; 1911, 24,312.

TER'APHIM. A Hebrew word, plural in form but of obscure origin, designating a certain kind of images used for oracular purposes. The teraphim appear to have been of various shapes, in some instances small enough to be hidden in the camel litter—as in the story of Rachel's theft of the teraphim belonging to her father, Laban (Gen. xxxi. 19, 34), while in others they had a human form and were large enough to be used as a substitute for a man, as in the story of Michal's successful deception of her father, Saul, by placing a teraph in David's bed (1 Sam. xix. 13–16). The reverence paid to the teraphim as household deities lent a persistence to the practices connected with them that survived even Josiah's reform (2 Kings xxiii. 24), and we find teraphim in vogue even in the Greek period (Zech. x. 2). Connected in some way with ancestor worship, it is not unlikely that there is some relationship between teraphim and Rephaim (q.v.)—the shades of the dead. Consult Schwally, *Das Leben nach dem Tode* (Giessen, 1892); I. Benzinger, *Hebräische Archäologie* (2d ed., Tübingen, 1907).

TER'ATOL'OGY. The study of the abnormal structures of plants, arising from any cause. Conspicuous among causes are parasitic fungi and insects, resulting in hypertrophies, some of which are known as galls. Many unusual structures arise in plants, however, which cannot be referred to such obvious causes. See MALFORMATION; MONSTROSITY.

TERBIUM, tẽr′bĭ-ŭm (Neo-Lat., from *Ytterb-y*, in Sweden). A very rare metallic element discovered by Mosander in 1843, but first isolated from other metals, in the form of its pure oxide, by Urbain in 1904. It was originally found with erbia, yttria, and other rare earths, in the mineral gadolinite from Ytterby, Sweden. The chemical symbol of terbium is Tb; its atomic weight is 159.2. It forms a white oxide of the formula Tb_2O_3 and a dark-brown peroxide of the formula Tb_4O_7.

TERBORCH, tẽr′bôrk (TER BORCH, TERBURG), GERARD (1617–81). One of the most eminent genre and portrait painters of the Dutch school. Born at Zwolle, he was first instructed by his father, an artist of some ability. In 1632 he went to Amsterdam, and in 1634 he was at Haarlem, the chief pupil of Pieter Molyn. The influence of the grand master of Haarlem, Frans Hals, is noticeable in his first dated picture, "Consultation" (1635, Berlin Museum). To the same period may be assigned the "Knife-Grinder's Family" (ib.), and "Boy with a Dog" (Pinakothek, Munich). In 1635 he went to England, where he painted several portraits of William III; in 1649 he was at Rome, and in 1645 again at Amsterdam. Thence in 1646 he went to Münster, Westphalia, where he painted his most celebrated work, the "Peace Congress of Münster" (1648, National Gallery, London), containing 60 likenesses, a perfect specimen of miniature portrait painting, and one of the most imposing historical works in Dutch art. Accompanying Count Peñeranda, one of the Spanish envoys, to Madrid, he achieved high success, and is credibly reported to have portrayed Philip IV. By 1650 he was back in Holland. In 1654 he settled at Deventer, where he resided till his death. Terborch's work falls into two stylistic periods—an early, resembling that of the earlier Amsterdam genre painters, Codde, Duck, and Duyster; and a later, beginning with 1651, strongly reminiscent of Metzu. A comparison of his paintings before and after the Spanish visit does not confirm the supposed influence of Velazquez. From 1651 till 1680 he painted a series of genre and small portrait subjects, unexcelled in Dutch or any other art. Among the best known are: "The Reading Lesson," "An Offer of Money," and "The Concert" (all in the Louvre); "The Despatch" (The Hague); "Paternal Admonition" (c.1655, Amsterdam and Berlin); "Trumpeter Delivering Love-Letter" (Munich); "Officer Writing Letter" and "Officer Reading Letter" (both in Dresden); and the "Guitar Lesson" (National Gallery, London). From 1669 his style became more delicate and simple, as may be seen in such works as: "The Music Lesson" (1660, Louvre); "Lute Player" (Antwerp, Cassel, and Dresden); "The Concert" (Berlin); "Lady Washing Her Hands" (Dresden); "Paring an Apple" (Vienna); and "The Letter" (Buckingham Palace, London), one of his most distinguished delineations. A striking example of fine modeling and masterly textures is "The Smoker," in the Berlin Museum. His "Meeting of the Town Council" (1667, Town Hall, Deventer) ranks next to his Münster picture as regards the number of figures. He painted also a large number of excellent single portraits, about 180 of which survive, masterly alike in characterization and in execution. Perhaps the most celebrated of these is the portrait of himself at The Hague. There are four excellent examples in the Berlin Museum, and one in the Metropolitan Museum, New York, which possesses also "A Lady Playing the Theorbo" (Altman collection) and "The Toilet," a wonderful arrangement in rose, loaned by J. P. Morgan. Terborch is one of the most perfect technicians in Dutch or any art. He excels in all pictorial qualities, line, composition, color, treatment of light, and atmosphere. His exquisitely finished detail never distracts from the general effect, and his textures are especially fine. Consult: Michel, *Terburg et sa famille* (Paris, 1888); Rosenberg, *Terborch and Jan Steen* (Leipzig, 1897); *Masters in Art*, vol. ii (Boston, 1901); Wilhelm Bode, *Great Masters of Dutch and Flemish Painting* (New York, 1909); Hofstede de Groot, *A Catalogue of Dutch Painting* (London, 1913).

TERCE. See BREVIARY.

TERCEIRA, tẽr-sā′ē-rȧ. The second largest island of the Azores (q.v.) (Map: Portugal, B 4). Area, 223 square miles. It is of volcanic origin. The coast is lined with precipitous cliffs of lava and the diversified surface attains a maximum altitude of 3500 feet in Caldeira de Santa Barbara. Wine, lumber, and archil are produced and largely exported. Angra do Heroismo (q.v.), the chief town of the island, is also the seat of government for the entire group. The population of Terceira in 1900 was 48,920.

TER′CEL. See PEREGRINE FALCON.

TER′CENTEN′NIAL EXPOSITION AT JAMESTOWN. A military, naval, marine, and historic exhibition in commemoration of the first permanent settlement of English-speaking people in America, on Hampton Roads, near Norfolk, Virginia, held from April 26 to Nov. 30, 1907. A site at Sewall's Point covering 400 acres of land space, with three miles of water front, was selected on which buildings were erected chiefly in the Colonial style of architecture for the purpose of displaying exhibits pertaining to army and navy, art, food products, historic art, machinery and transportation, manufactures and liberal arts, medicine, sanitation and hygiene, mines and metallurgy, mothers and children, the negro, United States government, and Virginia manufactures. State buildings, as well as an Auditorium and Convention Hall, and an Arts and Crafts Village, contained Colonial articles in metals, woods, and fabrics. The history of the United States from the settlement of Jamestown was portrayed. The government appropriated $1,575,000 in aid of the exhibition, and of this amount $50,000 was for a permanent monument at Jamestown.

TER′EBRAT′ULA (Neo-Lat., nom. pl., diminutive of Lat. *terebratus*, p.p. of *terebrare*, to bore, pierce). A name properly applicable to certain species of the Mesozoic and Tertiary fossil shells which are closely allied to *Terebratula phillipsi* of the Middle Jurassic. This group appeared in the Devonian, and, with a great expansion during the Mesozoic, it continues to the present day. As a rule the shells have a pentagonal or oval outline, with both valves convex, the ventral beak prominent and arching over the dorsal beak and perforated by an unusually large foramen. The earlier species are smooth-surfaced shells, while those of the Mesozoic are sometimes striated and in a few instances plicated.

TERE′DO. A small Lamellibranch mollusk of the genus *Teredo*. The common shipworm (*Teredo navalis*) is found widely distributed throughout the oceans, where it inhabits long and complicated borings which it makes in submerged piles of wharfs, floating logs, or the exposed bottoms of wooden ships. Wood which is attacked by teredos is soon rendered useless, and much damage is done by them annually, especially in tropical waters. The only absolute protection against the attack of the teredo is mechanical, such as sheathing the wood with copper, or with broad-headed short iron nails. Impregnating the wood with preservatives (creosote, etc.) has been tried with widely varying results. See SHIPWORM.

TEREK, tĕr′ĕk. A river of southeast Russia, one of the chief streams flowing from the Caucasus. It rises in a glacier near the summit of Mount Kazbec at an altitude of nearly 14,000 feet, and descends the north slope of the Caucasus in a tumultuous course through deep and narrow gorges. It then turns east, and after a flow of 400 miles, enters the Caspian Sea through a large delta. The river is navigable 254 miles for small vessels.

TEREK. A province in the eastern part of north Caucasia (see CAUCASUS) bordering on the Caspian Sea. Area, about 28,153 square miles (Map: Russia, F 6). It is bounded on the south by the Caucasus Mountains, many of whose highest peaks it contains. The interior is occupied to a large extent by the offshoots of the main chain and slopes towards the Terek and the coast, which is low and marshy. The region is watered by the Terek and its tributaries, and abounds in mountain lakes. In the lowlands along the coast and the Terek the climate is very unhealthful. Hence most of the settlements are found in the mountainous districts. Terek produces few minerals aside from petroleum, which is obtained in increasing quantities in the Grozny oil field, which in 1913 yielded 3275 tons per day. At Pyatigorsk (q.v.) are the best known of the mineral springs. Agriculture gives occupation to about 80 per cent of the inhabitants, but only a small portion of the cultivated land is utilized. The chief products are wheat, corn, rye, and hemp. The output of wine is extensive. The natives keep large numbers of horses and sheep. Pop., 1912, 1,231,600. Capital, Vladikavkaz (q.v.).

TER′ENCE (PUBLIUS TERENTIUS AFER) (c.190–c.159 B.C.). A Roman writer of comedies. He was born at Carthage, but was of African (not Phœnician) origin. He was brought to Rome as the slave of the Roman Senator Terentius Lucanus, who gave him a good education, and finally manumitted him. His first play was the *Andria*, staged in 166 B.C. Its success introduced its author to the most refined society of Rome, where his engaging address and accomplishments made him a particular favorite. His chief patrons were Lælius (q.v.) and the younger Scipio (q.v.). After living with them in great intimacy for some years he went to Greece, where he spent a year in studying the Greek comedies of Menander, Diphilus, Apollodorus, and others, and adapting them in Latin for the Roman stage. He never returned. He is supposed to have died by drowning. Six comedies are extant under the name of Terentius: *Andria*, *Hecyra*, *Heautontimoroumenos*, *Eunuchus*, *Phormio*, and *Adelphi*. Terence preserved a sort of charmed life throughout the dark ages when classical literature was almost forgotten, and on the revival of letters was studied as a model by the most accomplished playwrights, e.g., by Molière (q.v.). For his influence on English comedy see the introduction to the edition of the *Heautontimoroumenos*, by F. G. Ballentine (Boston, 1910). His language is pure, almost immaculate. Though he is inferior to Plautus in comic power, he is more than his match in consistency of plot and character drawing, in tenderness, in wit, and in metrical skill. The best text editions are those of Wagner (Cambridge, 1869), Umpfenbach (Berlin, 1870), Dziatzko (Leipzig, 1884), and Fleckeisen (ib., 1901). Good annotated editions of individual plays are those of the *Andria* by H. R. Fairclough (Boston, 1901); *Adelphi*, by K. Dziatzko (2d ed., rev. by R. Kauer, Leipzig, 1903); *Phormio*, by Dziatzko (4th ed., rev. ed., by E. Hauler, Leipzig, 1913); *Eunuchus*, by P. Fabia (Paris, 1895). A convenient annotated edition of all six plays is that by S. G. Ashmore (Oxford, 1908). The ancient Scholia to Terence by Donatus (q.v.) were edited by P. Wessner, 3 vols. (Leipzig, 1902–05). There are English translations by Colman (London, 1841); Riley (New York, 1859); Sargeaunt (London, 1912); and of the *Phormio* by M. H. Morgan (Cambridge, Mass., 1894). Consult W. Y. Sellar, *The Roman Poets of the Republic* (3d ed., Oxford, 1889); W. S. Teuffel, *History of Roman Literature* (Eng. trans., from 5th Ger. ed. by G. C. W. Warr, London, 1891); Martin Schanz, *Geschichte der römischen Litteratur*, vol. i, part i (3d ed., Munich, 1907); J. W. Duff, *A Literary History of Rome* (New York, 1909); M. S. Dimsdale, *A History of Latin Literature* (New York, 1915).

TERENTIANUS MAURUS, tē-rĕn′shĭ-ā′nŭs ma̤′rŭs. A Roman poet, a native of Mauretania (q.v.), who flourished at the end of the second century A.D. We have three poems by him, in hexameters, on prosody and the various metres, entitled *De Litteris*, *De Syllabis*, and *De Metris*. This work was much used by later writers. It has been edited by Santen and Van Lennep (with commentary, Utrecht, 1825), Lachmann (Berlin, 1836), Gaisford (Oxford, 1855), and, best of all, by H. Keil, in his *Grammatici Latini*, vol. vi (Leipzig, 1871–74). Consult Martin Schanz, *Geschichte der römischen Litteratur*, vol. iii (2d ed., Munich, 1905); W. S. Teuffel, *Geschichte der römischen Literatur*, vol. iii (6th ed., Leipzig, 1913).

TERE′SA, SAINT (1515–82). A famous Carmelite nun and mystical writer. She was born at Avila, in Old Castile. In her eighteenth year she entered a convent of the Carmelite Order in her native city, making her solemn vow on Nov. 3, 1534. In this convent she continued to reside for nearly 30 years. After a time her religious exercises reached a most extraordinary degree of asceticism. She began her work of reforming the Carmelite Order in the Convent of Avila, but afterward obtained permission from the Holy See, under the direction of Peter of Alcántara, to remove with her little community to St. Joseph's, a small and very humble convent in the same city, where she established in its full rigor the ancient

Carmelite rule, with some additional observances. This new convent was established in 1562. The general of the Carmelite Order, J. B. Rossi, was so struck with the condition of the convent that he urged upon her the duty of extending throughout the Order the reforms thus successfully initiated. Teresa entered upon the work with great energy, and succeeded in carrying out her reforms. (See CARMELITES.) She died at Alba, Oct. 4, 1582, and was canonized by Gregory XV in 1622, her feast being fixed on October 15. The third centenary of her death was celebrated with great splendor in 1882. Her works consist, besides her famous letters, mainly of ascetical and mystical treatises. Complete editions in Spanish were published at Madrid in 1877 and 1881; an excellent French edition is that of Bouix (Paris, 1859). English translations of her *Life* are edited by David Lewis (4th ed., New York, 1911) and by J. J. Burke (ib., 1911). Consult also: H. J. Coleridge, *Life and Letters of Saint Teresa* (3 vols., London, 1881–96); Alexander Whyte, *Santa Teresa* (New York, 1898); H. H. Colvill, *Saint Teresa of Spain* (ib., 1909); Alice, Lady Lovat, *Life of Saint Teresa* (St. Louis, 1912).

TEREUS, tē′rē-ŭs. See PHILOMELA.

TERGOES, tĕr′gōōs′. A seaport of the Netherlands. See GOES.

TERGOVISTE, tĕr′gō-vĭsh′tĕ, or TARGUVISHTEA. The capital city of the District of Dimbovitza, Rumania, 50 miles northwest of Bucharest, on the right bank of the Jalomitza (Map: Balkan Peninsula, E 2). As the former capital of Wallachia it had a population of 60,000 in the sixteenth century. The town is now an important strategic point. Pop., 1900, 9398.

TERHUNE, tĕr-hūn′, MARY VIRGINIA (HAWES) (1831–). An American novelist and journalist, born in Richmond, Va., of New England ancestry. She married in 1856 Rev. Edward P. Terhune of Brooklyn, was editorially connected with *Babyhood*, *Wide Awake*, *Saint Nicholas*, and *The Home-Maker*, and published under the name of Marion Harland many domestic manuals, social essays, sketches of travel, novels, and short stories, among which may be noted: *Alone, A Tale of Southern Life and Manners* (1854); *Husks* (1863); *Sunnybank* (1866); *At Last* (1870); *Common Sense in the Household* (1872), one of her best-known books; *Judith* (1883); *A Gallant Fight* (1888); *Dr. Dale* (1900), with Albert Payson Terhune; *When Grandmama was Fourteen* (1905); *Distractions of Martha* (1906); *Where Ghosts Walk* (1st series, 1908; 2d series, 1910); *Marion Harland's Autobiography* (1910); *Looking Westward* (1914); *The Long Lane* (1915).

TERLIZZI, tĕr-lĭt′sē. A town in the Province of Bari delle Puglie, Italy, 20 miles west by north of Bari and about 7 miles from the Adriatic. It has an ancient castle. It is active commercially. Wine and almonds are leading products. Pop. (commune), 1901, 23,232; 1911, 22,874.

TERM (OF. *terme*, from Lat. *terminus*, OLat. *termo*, *termen*, boundary, limit). In the law of real property, the time during which a tenant is entitled to enjoy an estate, according to his lease. The word is also sometimes employed to denote the estate or interest of the tenant. See LANDLORD AND TENANT.

TERM. See LOGIC.

TERM, CONNOTATION OF A. See CONNOTATION.

TERM, OF COURT. In practice the word "term" denotes a period in which a court holds a session. Under the common-law system in England the judicial year was divided into four terms, the names of which indicated the time of the year in which they were held, viz.: Hilary term, Easter term, Trinity term, and Michaelmas term. These terms were abolished by the Judicature Acts. In the United States the terms of court are arranged with reference to the number of judges available and the probable volume of judicial business to be disposed of. It is usual, however, to have a vacation of several months during the summer. The phrase is also used in the United States to describe the parts of the court, such as trial and special terms. The tendency of the modern system of courts is to divide the parts or terms according to the nature of the litigation.

TER′MINAL, RAILWAY. See RAILWAYS, *Yards and Terminals*.

TER′MINA′LIA. See TERMINUS.

TERMINAL SUGGESTION. See HYPNOTISM.

TERMINER. See OYER AND TERMINER.

TERMINI IMERESE, tĕr′mē-nē ē′mā-rā′zā. A city on the north coast of Sicily in the Province of Palermo, on the San Leonardo, 21 miles east-southeast of Palermo (Map: Italy, D 6). Though of archæological interest the modern town is flourishing but dull. It contains a collection of pictures and a few antiques, besides a library and school of seamanship. There are extensive tunny and sardine fisheries. The exports include Sicilian macaroni (for which the town is famous), besides wine, olive oil, fruits, grain, and rice. The warm saline springs are much frequented for bathing. Pop. (commune), 1901, 18,650; 1911, 20,319. Termini Imerese, the Roman Termæ Himerenses, was founded by the Carthaginians in 407 B.C., after the destruction of the ancient Himera (q.v.), the ruins of which are still to be seen. It had become largely Hellenized when it was captured by the Romans in the First Punic War.

TER′MINOL′OGY, MEDICAL. See NOSOLOGY.

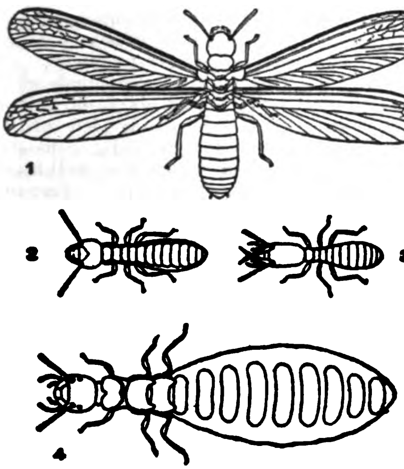
TERM INSURANCE. See LIFE INSURANCE.

TER′MINUS (Lat., boundary, limit). A Roman divinity presiding over public and private boundaries. His only sanctuary was in the Temple of Jupiter, on the Capitol, where he was honored in the form of a boundary stone, above which was an opening in the roof, that his rites might be performed, as ritual required, in the open air. Terminus has been regarded by some as an early god who later yielded to Jupiter, by others as a later schematizing offshoot from the original conception of Jupiter as the guardian of all boundaries. The Terminalia seems to have been simply a festival of neighbors at their common boundary lines. We hear of annual sacrifices also at the frontier (real or assumed), but dedications to Terminus are unknown before the days of the Empire. "Termini" or "terminal figures" are names applied to boundary marks consisting of a stele or upright stone carved at the top into the likeness of the head of the god. Such stones were imitated in the Renaissance in Italy as decorations for the corners of parterres or other garden divisions. Consult W. W. Fowler, *Roman Festivals* (London, 1899); Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

TER′MITE (from Lat. *termes*, *tarmes*, woodworm; connected with *terere*, Gk. *τείρειν*, *teirein*, to rub). Any one of the insects of the order

Isoptera, comprising those forms known as white ants. They are not at all related to the true ants, but their general appearance and the fact that they live in societies have given them the popular name. For an account of the community life and of the different castes of the termites, see INSECT, *Social Insects*.

The order Isoptera, which is most numerously represented in the tropics, includes only the single family Termitidæ, whence their common name "termite." They undergo practically no transformation. The young when it hatches from the egg is an active, crawling creature with six legs, much resembling the adult except in size. All species are social, and the communities consist of both wingless and winged individuals. The males and females which are winged have very long membranous longitudinally veined wings, in repose lying flat along the back, extending far beyond the abdominal tip. The hind wings are of nearly the same shape and size as the front wings, and across the base of each wing is a line of weakness indicating where the wing breaks after the nuptial flight. The nests, often built of earth, are hard and persistent, and sometimes more than 12 feet high. These ant hills are divided into chambers and galleries, and there are generally two or three roofs within the dome-shaped interior. The thick walls are perforated by passages leading to the nurseries and storehouses. Termites sometimes attack the woodwork of houses and soon reduce the thickest timbers to a mere shell. Those species which live in trees sometimes construct nests of great size, like sugar casks, of particles of gnawed wood cemented together and very strongly attached to the branches.



AMERICAN NORTHERN WHITE ANT (*Termes flavipes*).
1, adult male; 2, worker; 3, soldier; 4, supplementary queen. (After Marlatt.)

In the United States there are comparatively few species, and only one (*Termes flavipes*) which has a northward range. This is the common white ant found frequently living in the joists and other large timbers of houses. In these they make innumerable tunnels, running usually with the grain of the wood, so that, although a great deal of the substance of the wood is devoured, the main longitudinal fibres support the building structure for a long time. In fact, their presence in many houses would not be noticed except for the spring flight of the winged males and females. This species is probably native to North America, although it was accidentally introduced into Europe. A species known as *Termes tubiformans* occurs in Texas, and makes tubes around the grass stems and stems of other plants, while their nests are placed deep in the ground.

The origin of a new termite colony occurs after the nuptial flight, when the female's (queen's) wings break off; her body swells with eggs, grows enormously, and egg laying commences. Unlike the true ants or any of the other social Hymenoptera, the young require very little care from the workers. Just as with the true ants and other social insects, there are many termitophilous or guest insects to be found in the nests of termites. The damage done by termites in tropical regions is very great. In Central America it is almost impossible to erect wooden telegraph poles which will last for any length of time, as they are tunneled by these insects and fall very soon. Consult David Sharp, "Insects," in *Cambridge Natural History*, vol. v (London, 1895), and L. O. Howard, *The Insect Book* (new ed., New York, 1914).

TERMONDE, tĕr'mônd'. See DENDERMONDE.

TERN (Dan. *terne*, Icel. *þerna*, tern), or SEA SWALLOW. One of a group, the Sterninæ, of small gulls (q.v.), found in most parts of the world, and essentially gulls in habits and appearance. About 75 species are known, varying in size from the Caspian tern (*Sterna tschegrava* or *caspia*), which is nearly 2 feet long and 4½ feet across the wings, down to the dainty least tern (*Sterna antillarum*), which is only 9 inches long. The typical color of the terns is blue-gray above, white beneath, and black on the crown, but one or two species are pure white, some are black and white, some sooty brown, and some almost wholly black. The common tern is *Sterna hirundo*, abundant on the coasts of the whole Northern Hemisphere and of Africa. It breeds locally on the coast and in the Mississippi Valley from the Gulf States to Greenland, but, owing to incessant persecution, it selects only unoccupied sandy islets for its breeding places, and from New Jersey to Maine its only resorts now are Gull Island, N. Y., and Penikese, Weepecket, and Muskeget Islands, Mass. The Arctic tern (*Sterna paradisæa*) is very similar. Its egg is shown on Colored Plate, EGGS OF AMERICAN GAME AND WATER BIRDS, and is typical of tern's eggs generally. The gull-billed tern (*Gelochelidon nilotica*) of the Southern States, a cosmopolitan species; the roseate tern (*Sterna dougalli*) of the Atlantic coast; the sooty tern, or egg bird, of the West Indies (*Sterno fuliginosa* or *fuscata*), also southern; and the elegant tern (*Sterna elegans*) of the Pacific coast from California southward, are the most interesting among the 15 or 16 other North American species.

TERNATE, tĕr-nä'tȧ. A small but important island of the Moluccas, situated off the west coast of the island of Gilolo (Map: East India Islands, G 5). Area, about 25 square miles. It consists of an active volcanic peak, rising 5600 feet above the sea. The chief town, Ternate, has a population of about 9000 and a good harbor. It is the seat of the Sultan of Ternate, who has large dominions in Celebes, and is the capital of the Dutch Residency of Ternate, which embraces the northern Moluccas and parts of New Guinea and Celebes. Its climate is peculiar, owing to the difficulty of determining whether its one season is dry or wet. See MOLUCCAS.

TERNAUX-COMPANS, tår'nō' kôN'päN', HENRI (1807–64). A French historian, bibliographer, and diplomatist, born in Paris. He is best known for his remarkable collection of books and manuscripts on the early history of America, collected during diplomatic employment in Spain, Portugal, and Brazil. He was also once a member of the French Chamber of Deputies. He published a catalogue of Americana before 1700, *Bibliothèque américaine* (1836); also translations of documents in his collection in 20 volumes, *Voyages, relations et mémoires originaux pour servir à l'histoire de la découverte de l'Amérique* (2 series, 1836–40); and other works of less significance.

TERNAY, tår'nā', CHARLES LOUIS D'ARSAC DE (1722–80). A French naval officer, born at Ternay, in Normandy. He entered the navy in 1738 and fought at Louisburg in the French and Indian War. In 1762, in command of a squadron, he attacked Newfoundland, and captured St. John's and several British vessels. He was Governor of the island of Bourbon (1772–79). In 1780 he commanded the French fleet that brought over to America Count Rochambeau and his forces. He died at Newport soon after his arrival.

TERNI, tĕr'nē. A city in the Province of Perugia, Italy, 59 miles south by east of the city of Perugia, on the Nera River, near its confluence with the Velino (Map: Italy, D 3). The many Roman remains, including an amphitheatre, sculptures, baths, inscriptions, etc., are interesting. The city has a large government arsenal and extensive iron and steel interests. Woolen goods, brick, olive oil, and wine are also manufactured. Near by are the famous falls of Terni, in the Velino River—the Cascate delle Marmore—with a total descent of 650 feet, supplying power to the city. Pop. (commune), 1901, 30,641; 1911, 32,754. Terni, the ancient Interamna, was of considerable importance under the Romans.

TERNINA, tĕr-nē'nå, MILKA (1864–). An Austrian dramatic soprano, born at Vezisce (Croatia). At 12 she began her vocal studies with Madame Winterfeld, and in 1880 she entered the Vienna Conservatory, where for two years she studied with Gänsbacher. While still a student she made her début at Agram as Amelia in Verdi's *Ballo in Maschera*. From 1883 she sang successfully at Leipzig, Graz, and Bremen. In 1890–99 she was a member of the Court Opera at Munich, where she soon was acknowledged one of the foremost interpreters of Wagner's heroines. In 1896 she made her American début with Mr. Damrosch's company, and instantly won marked favor. In 1899–1904 she was one of the principal attractions of the Metropolitan Opera House, where she sang Kundry in the first American performances of *Parsifal*. After 1899 she appeared frequently in Bayreuth. Owing to ill health her appearances after 1906 were rare. Although in the front rank of the great Wagner interpreters, she won scarcely less fame as a lieder singer, especially in the songs of Brahms.

TERN'STRŒMIA'CEÆ (Neo-Lat. nom. pl., from Ternstrœmia, named in honor of the Swedish naturalist Ternström). A family of dicotyledonous trees and shrubs, including about 16 genera and 160 species, natives of warm and tropical regions. The best-known representatives are the tea (q.v.) plant and camellia (q.v.). The family is represented in North America by *Stewartia* and *Gordonia* (q.v.), the latter being called loblolly bay or tan bay. Another name of the family is Theaceæ (tea family), which is coming into common use.

TERPAN'DER (Lat., from Gk. *Τέρπανδρος*, *Terpandros*). A Greek musician who lived in the seventh century B.C. He was born at Antissa, in the island of Lesbos, went to Sparta, and in 676 was crowned victor in the first musical contest at the feast of Apollo Carneius. He established there the first musical school in Greece and is credited with the enlargement of the compass of the lyre to an octave. He was the first to set poetry regularly to music.

TERPENES. Unsaturated compounds of the composition (C_5H_8) yielded by plants or built up by organic synthesis. They are divided into the following groups: *Hemiterpene*, C_5H_8, consisting of isoprene chains from which the well-known geranial or citral is a derivative. *Terpenes*, $C_{10}H_{16}$, ring forms, familiar as pinene and limonene. *Sesquiterpene*, $C_{15}H_{24}$, contained in oils of clove, cedar, hops, patchouli, etc. *Polyterpenes*, $C_{20}H_{32}$, principally occurring as caoutchouc or rubber. *Isoprene* or methyl *butadiene*, C_5H_8, is chiefly important as the starting point for the synthesis of rubber. By heating two or more equivalents of the compound in the presence of weak acetic acid from 100–200° C. (212–392° F.) rubber is formed. According to Pickles, *Journal Chemical Society* (London, 1910), rubber consists of a long chain made up of isoprene links—$CH_2 \cdot CCH_3 \cdot CH \cdot CH_2 \cdot CH_2 \cdot CCH_3 \cdot CH \cdot CH_2$—etc. See RUBBER; SYNTHETIC RUBBER.

The terpene, $C_{10}H_{16}$, group contains two important hydroaromatic forms, limonene and pinene. The former is monocyclic and absorbs two molecules of halogen acid or four atoms of halogen, the latter is bicyclic and absorbs one molecule of halogen acid or two atoms of halogen. Pinene occurs in American oil of turpentine as the dextrorotary form (australene) and in German or French turpentine as the levorotary type (terebenthene). Both occur in various essential oils—rosemary, sage, juniper, etc. Pinene combines with dry hydrogen chloride to form an addition product known as artificial camphor. On heating the hydrochloride with alcoholic potash, camphene, an isomer of pinene, is formed. The same result is obtained by the action of strong sulphuric acid on turpentine. By oxidation with chromic acid camphene yields camphor, $C_{10}H_{16}O$.

Limonene occurs in two optically active forms: dextrolimonene in orange, lemon, and caraway oils; levolimonene in firwood oil. Both form liquid hydrochlorides with two molecules of HCl, and take four atoms of bromine. By mixing equal quantities of the dextro and levo forms a racemic type is obtained; this is called dipentene and occurs in Russian and Swedish turpentine. Carophyllene of cloves, humulene of hops, cedrene of cedar oil, and conimene of incense resin are among the sesquiterpenes isolated and studied. See HYDROCARBONS.

TERPSICHORE, tĕrp-sĭk'ô-rē (Lat., from Gk. *Τερψιχόρη*, fem. of *τερψιχόρος*, *terpsichoros*, delighting in the dance, from *τέρψις*, *terpsis*, enjoyment + *χορός*, *choros*, dance). In Greek mythology, one of the nine Muses (q.v.). She presided over the choral dance. In the later assignment of functions to the Muses, she was regarded as the Muse of the lesser lyric poetry, and was distinguished by the lyre.

TERQUEM, tär'kăɴ', Olry (1782–1862). A French geometer, born at Metz of Jewish parents. In 1804 he was called to Mainz as professor of mathematics in the Lyceum, and afterward to a similar position in the school of artillery. Returning to Paris in 1814, he was appointed librarian in the artillery depot at Saint-Thomas-d'Aquin. Terquem was a distinguished geometer and is well known for his *Nouvelles annales de mathématiques*, a publication which he founded together with Gerono in 1842, and which is still continued. He also wrote a work entitled *Bulletin de bibliographie, d'histoire et de biographie mathématiques* (7 vols., 1855–61).

TERRACE (Fr. *terrasse*, from It. *terraccia*, *terrazzo*, terrace, from *terra*, from Lat. *terra*, earth). 1. In geology, a stretch of comparatively level land along the shore of a lake or the ocean or bordering a river course and elevated some distance above water level. Terraces frequently occur in series, one rising above the other as the distance from the shore increases. River terraces owe their origin to the cutting down of flood plains; as a river channel widens and deepens the flood plain is gradually cut away until only the edges near valley walls remain. This process may be repeated several times, giving rise to a succession of terraces—the oldest having the highest elevation and being farthest removed from the river. The drift terraces so common in the northern States are remnants of flood plains that were formed when the overloaded streams of the Glacial period filled their preglacial valleys. Lake terraces mark former shore lines and are evidence of a shrinkage in the volume of the lakes. They are well marked around most of the Great Lakes, on the shores of Lake Champlain, and lakes of the Great Basin. Their abundance has suggested the term "Terrace epoch" to designate the geological period during which they were produced. See Beaches, Raised; Lake; Lake Agassiz; River; etc.

2. In architecture and gardening, a terrace is a level space or platform of earth or masonry, raised or embanked above the surrounding grade, or partly cut out and partly embanked on a slope to provide a horizontal surface for planting, for promenading, or for decorative buildings. In formal gardening the terrace is faced and held up by a vertical retaining wall, often of decorative design, crowned by a balustrade and provided with stairways from the next level below. English country houses are usually set on a low broad terrace projecting in front or both in front and rear. The terraces of Italian gardens are adorned with flowers, trees, grottoes, fountains, and statuary, and constitute their most distinctive feature.

TERRACINA, tĕr'rȧ-chē'nȧ. A city in the Province of Rome, Italy, 76 miles southeast of the city of Rome, on the Tyrrhenian Sea, and at the south end of the Pontine Marshes (Map: Italy, D 4). The ancient city occupied a commanding position on the crest of a hill overlooking the modern site. This section affords a magnificent view and has interesting remains of the Roman period, notably those of the imposing Temple of Venus, which until 1894 were supposed to belong to a palace of Theodoric the Ostrogoth, and an amphitheatre. The Cathedral SS. Pietro and Cesareo in the modern city, occupying the site of another Roman temple, is of much architectural beauty. Pop. (commune), 1901, 11,310; 1911, 11,121 (town, 7579). Terracina, the Volscian Anxur and the Latin Tarracina, was of considerable military importance under the Romans.

TER'RA COT'TA (It., baked earth). Hard-fired earthenware, especially that which is used for architectural material.

Greece. Terra-cotta statuettes are among the most charming and dainty products of Greek art. The archaic terra cottas are numerous, especially on sacred sites. The later figurines from the fourth century B.C. and the Hellenistic period have been found in tombs at many sites, but the earlier group is best represented by the statuettes from Tanagra in Bœotia, which are strongly influenced by the art of Praxiteles and his contemporaries. In the later period the characteristics of Hellenistic art are seen in terra cottas from Asia Minor (especially Myrina), Sicily, and southern Italy. The attractiveness of these figures had led to many imitations, frequently very skillful. The ancient figures were made in molds, sometimes as many as 16 being employed for one figure; then after baking they were often retouched or engraved, and finally painted in brilliant colors on a coating of white lime. For architecture the pieces were finished in true ceramic painting, simple but excellent. In central Italy, especially in Etruria and Latium, crude brick seems to have been largely employed, and hence terra cotta was used for decorative purposes in important buildings at a time when in Greek lands it had been largely supplanted by stone. In this region also terra cotta seems to have been used much more extensively for large figures than among the Greeks.

Middle Ages and Renaissance. Throughout the Middle Ages, baked clay was used in architecture, chiefly for floor tiles, but also for roof-crestings and ornamental finials. In the great plain of north Germany, where stone was rare and fictile clay abundant, a whole school of Gothic architecture in brick grew up in the fourteenth century and continued for 200 years; the decorative reliefs modeled in clay and used as capitals, friezes, etc., are of singular interest. Elaborate decorative gables and parapets were made of this material and baked so hard that they are terra cotta rather than brick. In Italy, at the time of the early Renaissance, the material is used very freely in elaborate detail in churches and in private dwellings. Another epoch of art during which terra cotta was freely employed was of the eighteenth century, when, especially in France, terra-cotta statuettes and groups were made in profusion, and vases, clocks, etc., decorated by reliefs and figures in the round, were made for decorative effect. Famous masters of this art were three sculptors of the name of Adam (Lambert Sigisbert, and his brothers Nicholas Sébastien and François Gaspard), and especially Claude Michel, commonly known as Clodion.

Nineteenth Century. In the latter half of the nineteenth century the use of terra cotta as a building material was resumed in connection with the Gothic revival and increasing demand for decorative detail. Late in the century some slight attempts were made to introduce polychromy of a permanent kind in connection with this material. Some of the best terra cotta for buildings is made in the United States; and here also color has been sparingly used. Among its advantages as a building material are the ease with which it may be molded to any desired architectural or sculptural form and indefinitely repeated, its durability, lightness, strength, and cheapness. It may be made in almost any desired color, but is usually dark red.

Manufacture. A better grade of clay is required for terra cotta than for brick. Oftentimes clays from different localities must be mixed to secure the right color, while vitrifying ingredients (pure white sand, old pottery or fire brick finely ground) are added to secure partial vitrification. After weathering, the selected clay is ground or washed (see CLAY, *Clay Mining and Working*), mixed with vitrifying ingredients and water; next, the various sorts of clay are piled in layers. Vertical slices from this mass are taken to either a pug mill or rollers for tempering. The material is next sent to the molding room in cakes of convenient size. If only one piece is required, the clay may be modeled by hand, ready for baking; but if the design is to be repeated a model is made and a mold taken, into which the clay is forced by hand. After partial drying the product is turned over to the finisher, who may be more or less skilled, according to the character of the design. After drying, the forms are baked or burned, as described under KILN.

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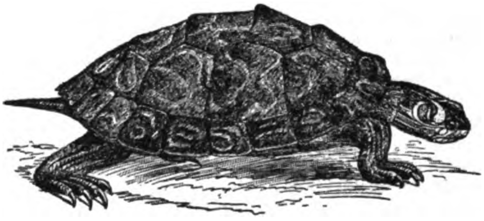
TERRA DEL FUEGO, tĕr′rȧ dĕl fwā′gȯ. A corrupted form of Tierra del Fuego (q.v.).

TERRAMARE, tĕr′rȧ-mä′rȧ (from It. *terra amara,* bitter earth). The term applied to certain low mounds with level tops in the valley of the Po, which are supposed to have formed the foundations of prehistoric Italian villages. In them are found fragments of bones, pottery, tools, implements of war, and the like, which cast light on the ancient civilization of Italy in the Neolithic period. See ITALY, *Ethnology;* KITCHEN MIDDEN; LAKE DWELLINGS.

TERRANOVA, tĕr′rȧ-nō′vȧ. A seaport in the Province of Caltanissetta, Sicily, 75 miles by rail east by south of Girgenti (Map: Italy, E 6). There are tunny and sardine fisheries, and manufactures of woolen goods. The exports are grain, wine, sulphur, soda, and cotton. Terranova was built by Frederick II in the thirteenth century on the site of Gela (q.v.). The ruins of the ancient necropolis have yielded numerous vases, and the excavations of 1906 uncovered the remains of an important temple. Pop. (commune), 1901, 22,114; 1911, 22,019.

TER′RAPIN (probably of North American Indian origin). Any of several species of fresh-water or brackish-water or mud turtles of the family Emydidæ, natives of tropical and the warmer temperate countries. The neck can be wholly retracted within the shell; the head is flat, and the jaws prolonged into a beak. Terrapin feed partly on vegetable food, but also devour fish, reptiles, and other aquatic animals. They swim very well, and even on land move with much greater swiftness than land tortoises. The family is represented in the United States by about 20 species. The word "terrapin" has no exact scientific significance, but in the United States it is more commonly applied to the diamond-back terrapin (*Malacolemmys centrata* or *palustris*). This species is found in salt marshes from New York to Texas, and is gray with black markings. Its flesh is highly esteemed as a table delicacy, and in some places along the southern coast these turtles are reared for market in inclosures in large numbers.



EDIBLE TERRAPIN, OR DIAMOND-BACK.

TERRAZZO, tĕr-răt′sō. A kind of flooring much used in modern practice for corridors and floors of public buildings; it is composed of small fragments of marble set in a white cement and rubbed to a polish after it has set. By the use of fragments of different colors decorative effects of mosaic may be produced. The process and the name are derived from Italy, where it is called "terrazzo Veneziano." It was introduced into the United States towards the end of the nineteenth century.

TERRE, tĕr, LA (Fr., The Earth). One of Zola's Rougon-Macquart novels (1887), in which the author presents a brutally realistic study of peasant life.

TERRE HAUTE, tĕr′*e* hōt′. A city and the county seat of Vigo Co., Ind., 72 miles west by south of Indianapolis, on the Wabash River, and on the Cleveland, Cincinnati, Chicago, and St. Louis, the Vandalia, the Chicago and Eastern Illinois, and the Chicago, Terre Haute, and Southeastern railroads (Map: Indiana, C 6). Terre Haute is the seat of the Rose Polytechnic Institution, Indiana State Normal School, and St. Mary's Institute. Other noteworthy institutions include the Rose Orphans' Home, St. Ann's Orphans' Home, St. Anthony's Hospital, Union Hospital, the Elks' and Odd Fellows' lodges, the Y. W. C. A., and Rose Dispensary. The Emeline Fairbanks Memorial Library has about 47,000 volumes. The State Normal Library has 65,000 volumes. Terre Haute carries on considerable trade, being the centre of a productive region, largely devoted to agriculture, and containing valuable coal, clay, oil, and gas deposits. The various manufactures (1909 census) had $10,371,000 capital and a production valued at $21,793,000. There are also foundries and machine shops, flour and hominy mills, clothing factories, rolling mills, slaughtering and meat-packing establishments, car works, breweries, distilleries, planing mills, and manufactures of carriages, glass, electric motors, stoves, brick, enameled ironware, gunstocks, tools, steel castings, wheels, etc. There are three large ice plants. An important industry of the district is the raising of fine show and harness horses. For maintenance and operation the city spent, in 1913, $692,500, the principal items being: schools, $270,000; fire department, $124,000; police department, $78,000; for highways, $64,000; and interest on debt, $33,000. Pop., 1900, 36,673; 1910, 58,157; 1915 (U. S. est.), 64,806. Terre Haute was founded in 1816 and was chartered as a city in 1833.

TER'RELL. A city in Kaufman Co., Tex., 32 miles east of Dallas, on the Texas and Pacific and the Texas Midland railroads (Map: Texas, D 3). It is the seat of the North Texas Hospital for the Insane, and has a military college for boys, Carnegie library, and an Elks' Home. Terrell is the commercial centre of a region engaged in truck farming, cotton, wheat, and fruit growing, and having besides important cattle-raising and lumber interests. It is also known for the manufacture of cottonseed oil. It has shops of the Texas Midland Railroad, cotton gins, a cotton compress, a flour mill, a foundry, a canning factory, a manufactory of cotton goods, etc. The city has adopted the commission form of government. Pop., 1900, 6330; 1910, 7050.

TERRES'TRIAL ELECTRICITY. The science pertaining to electrical phenomena exhibited by the earth and atmosphere. Under normal conditions the surface of the earth is everywhere negatively charged, and the magnitude of the charge density is such that the potential gradient, or increase of electrical potential per meter increase of altitude above the surface, amounts to about 150 volts per meter. The potential gradient shows annual and diurnal variations of very considerable amount; it diminishes with increase of altitude, and probably becomes sensibly zero at altitudes of little more than 10 kilometers, a fact which leads, by a direct application of the fundamental principles of electrostatics, to the conclusion that there is a positive charge in the atmosphere, sensibly equal in total amount to the negative charge on the earth.

The atmosphere possesses the power of conducting electricity to an extent which, though extremely small, is nevertheless sufficient to insure that nine-tenths of the charge on the earth would disappear in 10 minutes if there were no means of replenishing the loss. Although many attempts have been made to account for the permanent existence of an electrical field in a conducting atmosphere, no completely satisfactory theory has yet been evolved. See ATMOSPHERIC ELECTRICITY.

The conductivity of the atmosphere arises from the presence in it of positive and negative ions formed by the splitting up of neutral gas molecules. These ions are of two main classes, the so-called small ions, which contribute the greater part of the conductivity, and large ions; the latter move in a unit electrical field with velocities only about 1-3000th of that of the former, and are probably formed by the combination of small ions with dust nuclei. The usual methods of measurement reveal only the small ions, and about 800 pairs of these are usually found per cubic centimeter.

Since ions, when left to themselves, recombine at a rate given by an_+n_- where n_+ and n_- are the numbers of positive and negative ions per cubic centimeter and a is a constant, it is necessary to suppose that in the steady state they are produced at a rate q per cubic centimeter per second, equal to this amount. If we leave the large ions out of consideration, the value of q necessary to account for the presence of the small ions is about 1.6.

Radioactive substances are known to emit radiations which possess the power of ionizing a gas (see RADIOACTIVITY), and the radioactive materials in the earth and atmosphere over land are known to be sufficient to account for a value of q equal to about 4.3, i.e., a value sufficiently large to provide for all of the measured ions and for some of the large ions as well. There is, however, another important source of ionization in the atmosphere.

If a vessel which has been freed from radioactive air is hermetically sealed, it is found that over land about 10 ions are produced in it per cubic centimeter per second. Calling this quantity in any particular case R, a portion of R must be considered as caused by radioactive impurities in the walls of the vessel itself, but the phenomenon which is responsible for the ionization not produced in this way is called the penetrating radiation. A part of the penetrating radiation is undoubtedly nothing more than that portion (the γ rays) of the radiation from the external radioactive materials in the soil and air which is sufficiently penetrating to pass through the walls of the containing vessel; but over the great oceans, where the radioactive material in the sea water and air is found to be insignificant in amount, values of R equal to about 4 are obtained, and these must consequently be attributed to some other cause. That the whole effect is not a result of impurities in the walls of the vessel is borne out by the fact that R increases very considerably with altitude.

The numbers of ions per cubic centimeter have been found to be as large over the great oceans as over land, or larger, a result amply confirmed by the recent extensive observations made on cruises of the yacht *Carnegie*, belonging to the Department of Terrestrial Magnetism of the Carnegie Institution of Washington. The result is at first sight surprising when it is remembered that the radioactive material, which forms so important a factor in the ionization over land, is almost entirely absent over the great oceans. It is probable that the influence of the greater value of q which must certainly exist over land is offset, as far as the measured ionic numbers are concerned, by a larger proportion of the ions produced over land going into the large type as a result of combination with dust nuclei, and it is not improbable that over the large oceans the ions are practically all of the small type.

Instrumental Appliances. The appliances for potential-gradient measurements over land are described in the article on atmospheric electricity (q.v.). For ocean work the usual forms of "collector" are unsuitable mainly on account of the difficulty of securing satisfactory insulation. In the apparatus employed on the *Carnegie* a long brass tube, carrying a sort of parasol attachment at one end, is mounted on insulated bearings fixed to the stern rail of the ship in such a way that it can be turned in a vertical plane containing the fore-and-aft line. Relative values of the potential gradient are obtained by measuring the alteration in potential which the insulated system undergoes when it is turned through a fixed angle from an earthed position.

The values of n_+ and n_- are usually measured by drawing air at a measured rate through the space between two concentric cylinders charged to a difference of potential sufficiently high to insure that all of the ions of sign opposite to that on the central cylinder are drawn thereto as the air passes through. The central cylinder is connected to an electroscope, and the alteration in potential of the electroscope during the passage of a known amount of air, combined with a knowledge of the electrical capacity of the apparatus and the charge e on a single ion, leads directly to the evaluation of n_+ or n_- as the case may be.

The conductivities λ_+ and λ_- for positive and negative ions are respectively n_+ev_+ and n_-ev_-, where v_+ and v_- are the velocities under unit electrical field of the particular ion concerned. They are usually measured by a method similar to that for measuring n_+ and n_-, except that the space between the cylinders is wider, and the potential difference between them is less than the amount necessary to extract from the air all of the ions concerned. Under these conditions the theory of the instrument shows that the rate of alteration of the potential of the central insulated system is independent of the velocity of the air; it depends only upon λ_+ or λ_- as the case may be, on the initial potential difference between the cylinders, and on the capacities of certain parts of the instrument.

Estimates of the amount of radioactive material in the atmosphere have generally been made by utilizing the fact that a negatively charged body exposed to air containing radioactive substances collects an active deposit. (See RADIOACTIVITY.) Measurements of the activity of the deposit obtained under specified conditions in this way afford a rough means of obtaining relative values of the amount of active material in the atmosphere. More accurate measurements of an absolute nature are made by drawing the air over coconut charcoal; the charcoal absorbs the emanation, which may subsequently be expelled by heat and measured by its effect in producing ionization in a suitable vessel.

The intensity of the penetrating radiation is usually ascertained by measuring the saturation current I in a hermetically sealed vessel of volume V, provided with an insulated central electrode connected to an electroscope. The value of R is then equal to I/Ve, where e is the electronic charge (4.7×10^{10} E.S.U.).

Upper Atmosphere. Our knowledge of the electrical conditions in the upper atmosphere is very small, and is for the most part a matter of conjecture, but many considerations suggest that at great altitudes the conductivity is enormously greater than at altitudes which are attainable. The chief sources of ionization in the upper atmosphere are probably the ultra-violet light from the sun, and the negatively (and possibly positively) charged particles generally supposed to be emitted by that body. These corpuscles, entering the vicinity of the earth's magnetic field, will be deflected thereby according to known laws, and by following out the consequences of this view, Birkeland has formulated a theory (illustrated by many laboratory experiments) in which the aurora is explained by the entrance into our atmosphere of high-speed negative corpuscles from the sun. In order, however, to account for the necessary magnitude of the magnetic deviation, and for the extension of the aurora to low altitudes, it is necessary to postulate that the negative corpuscles have energies very much greater than we are familiar with in laboratory experiments. These difficulties are to some extent lessened by supposing, as Stoermer and Vegard have done, that the particles concerned are, at any rate in part, positively charged atoms of great energy, similar to or identical with α rays.

Estimates of the altitude of the aurora are attended with considerable uncertainty; some claim to have observed it at altitudes as low as 10 or even 1 kilometer. Stoermer has recently made precise measurements of the parallax of its beams and arches, by taking, at stations a few kilometers apart, simultaneous photographs of the aurora and of the brightest stars appearing through it. The altitudes obtained range from 40 kilometers to 260 kilometers. More recently Stoermer has employed the cinematograph to facilitate the following of rapid changes in the aurora.

Earth Currents. During periods of sun-spot activity and magnetic storms (see TERRESTRIAL MAGNETISM) earth currents may attain values sufficiently great to render them a source of serious trouble in telegraphy, but during undisturbed periods they are very small, the potential difference which causes them being only of the order of magnitude of 0.1 volt per kilometer. The general direction of the earth current in Europe seems to be from southwest to northeast.

Earth currents have so far been investigated mainly by measuring the current obtained in a wire terminating in two large plates embedded in the soil at a considerable distance apart; the product of the current so obtained and the resistance of the wire gives the potential difference between the plates, which is the quantity of primary interest. Lines ranging in length from a few meters to thousands of kilometers have been employed, but naturally the electrolytic effects at the plates become a source of serious trouble in the case of the shorter lines. The most extensive series of observations on earth currents are those of Weinstein, extending over a period of eight years and made on two telegraph circuits, one from Berlin to Dresden, 120 kilometers nearly N.S., and the other from Berlin to Thorn, 262 kilometers nearly E.W. The normal earth currents show decided diurnal variations, which are related in a very remarkable way with the diurnal variation of the horizontal intensity of the earth's magnetic field.

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TERRESTRIAL EQUATOR. See EQUATOR, TERRESTRIAL.

TERRESTRIAL MAGNETISM. The science which concerns itself with the magnetic properties of the earth and the various phenomena exhibited in consequence of these properties. That the earth has magnetic properties is shown by the behavior of a magnetic needle when freely suspended at any one place on the earth's surface; it is found to take a definite direction, to which it invariably returns when displaced. It is not known as yet whether the earth's magnetism arises chiefly from substances in the magnetized condition exhibited by the natural magnet, the lodestone or magnetic (q.v.), and by the artificial magnet (q.v.), or whether it has arisen as the result of electric currents circulating approximately in the direction from east to west within the earth. In brief, we do not know as yet whether the earth is a magnet or an electromagnet. All that we can say is that the earth acts like a magnet, and that, in consequence, it is surrounded by a magnetic field whose lines of force extend far out into illimitable space; the direction taken by the freely suspended needle, supposed above, is tangent to one of these lines of force. We do know, however, the following definite facts:

a. The systems of magnetic and electric forces which may be responsible for the earth's magnetic field are situated almost entirely below the earth's surface. Indeed, probably not over 5 per cent of the earth's field is caused by systems located in the regions above the surface.

b. The internal system of forces and about half of the external system (the 5 per cent) may be referred to a potential, i.e., if we are dealing with electric currents, they circulate in such a manner as not to cut the earth's surface. A system of electric currents cutting the earth's surface, so as to pass, e.g., from the atmosphere into the earth, or vice versa, is at present supposed to account for the remaining 2 or 3 per cent of the total magnetic field.

c. If magnetized substances cause the earth's magnetic field, then they probably would have to be confined to a stratum extending down not over 10 miles below the surface, for beyond this depth temperatures would be encountered at which, as far as we know, substances could not exist in the magnetized state. Whether or not the increase of pressure encountered as we penetrate into the earth's interior would tend to counteract the deleterious effect of increased temperature on magnetized substances is not definitely known. However, the increase of temperature with depth would be conducive to the production of a magnetic field caused by electric currents.

d. Roughly, 65 to 70 per cent of the earth's magnetic field can be represented by a formula based on some kind of uniform magnetization (see MAGNETISM) parallel to a diameter inclined about 11.5° to the earth's axis of rotation. At present the average effective intensity of magnetization (magnetic moment per unit of volume), in C. G. S. units, is about 0.07, and the magnetic moment of the entire earth, if R be the earth's mean radius, $0.32R^3 = 0.32 \times (6.37 \times 10^8)^3 = 8.3 \times 10^{25}$. The earth's average intensity of magnetization is about $\frac{1}{10{,}000}$ that of very highly magnetized steel.

e. The earth's magnetic field is more or less unstable and is in a continual state of flux. External causes may, in a moment, cause a change amounting at times to as much as 5 per cent of its apparently permanent intensity of magnetization (ρ). Generally this derangement may be regarded as being caused by a demagnetizing system, the effect of which is equivalent to a diminution in ρ which may last for a comparatively long period. Thus it took the earth's magnetic field about three months to recover from the effect of the exceptionally severe magnetic storm of Sept. 25, 1909.

The earth's complex magnetic field may be resolved into the following main magnetic systems: (1) The polar system—a uniform magnetic system, symmetrical about and parallel to the earth's axis of rotation, oriented so as to cause the north end of a magnetic needle to point everywhere north, and below the horizon, in the Northern Hemisphere; (2) the equatorial system—a uniform magnetic system of about one-fifth of the strength of (1), symmetrical about and parallel to a diameter lying in the equatorial plane, oriented, did it alone exist, so as to cause the north end of a magnetic needle to point everywhere at present towards a subsidiary pole on the equator in longitude about 70° west of Greenwich; (3) the distorting, transverse system giving rise to a subsidiary magnetic field approximately of one-fifth of the strength of the combined system (*d*), composed of (1) and (2), asymmetrical both about the earth's axis of rotation and its equatorial plane, oriented in opposite directions in the Northern and Southern Hemispheres; (4) regional and local disturbance systems. Were systems 1 and 2 alone existent, magnetic observations at but very few places would suffice to determine the positions of the magnetic poles (see below) and to calculate in turn, with high accuracy, the values at all other places on the earth of the magnetic elements (q.v.): declination (D), inclination or dip (I), and horizontal intensity (H), or the horizontal component of the total strength of the field. Owing, however, to the effects from systems 3 and 4, no formula has as yet been established which will yield computed values of the magnetic elements with accuracy sufficient for even the purely practical purposes of the surveyor and the navigator. Nor has any one as yet succeeded in establishing laws by means of which reliable values of the magnetic elements could be predicted for any place on the basis of the existing values. Hence the need of magnetic surveys of land and ocean areas for determining by actual observation the prevalent values of the magnetic elements at sufficient places for the construction of magnetic charts.

Magnetic Charts. Nearly every civilized country has organized magnetic services for the purpose of charting the magnetic elements. The most extensive work of this kind at present is being done by the Carnegie Institution of Washington, through its Department of Terrestrial Magnetism. This organization has as its special aim the securing of magnetic data in regions, either not within the jurisdiction of any one country, or where, for one reason or another, there are no existing data nor any likely to be obtained in the near future. Since 1905 its expeditions have been sent to almost every region of the globe, and magnetic data have been secured in all the oceans on cruises of aggregate length nine times that of the earth's circumference. The specially constructed non-magnetic vessel, the *Carnegie*, reached the parallel of 80° N., off Spitzbergen, in 1914; in 1915–16 she circumnavigated the region between the parallels 50° to 60° S. By the end of 1917 this department, it is expected, will be able to undertake the construction of world-magnetic charts, with an accuracy and detail not heretofore possible. The accompanying plate shows the lines of equal magnetic declination, or isogonic lines (q.v.), and of equal annual change for the United States in 1915, and the second plate similar lines for the earth in 1915. Under DECLINATION will be found a table of Magnetic Declinations and Annual Changes in the United States for Jan. 1, 1910. Fig. 1 shows the lines of equal inclination or isoclinics (q.v.) for the earth in 1905. Similarly there are charts giving the lines of equal horizontal intensity, of equal vertical intensity, and of equal total intensity of the earth's magnetic field. See ISODYNAMIC LINES; ISOMAGNETIC LINES.

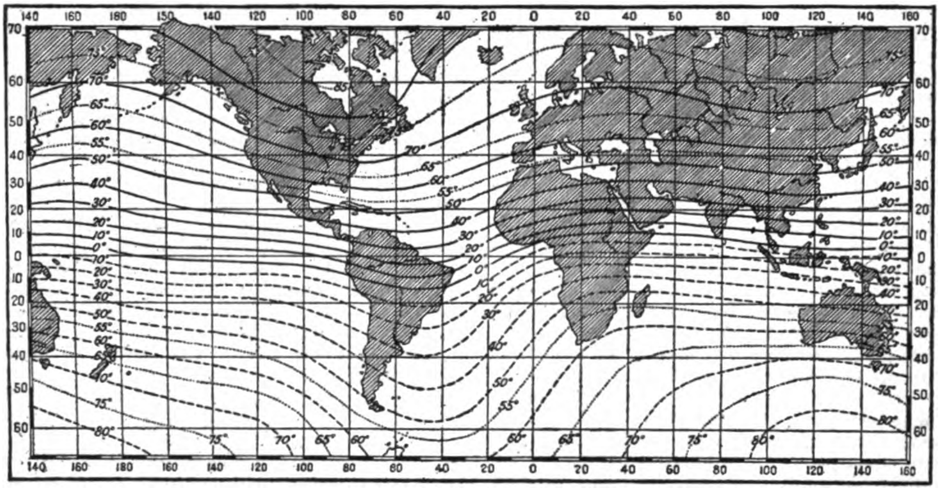


FIG. 1. Chart showing lines of equal magnetic inclination for the earth in 1905 (British Admiralty). The north end of the dip needle points below the horizon in all of the region (north magnetic hemisphere) north of the zero line (magnetic equator), and above the horizon in all the region (south magnetic hemisphere) south of the line.

Secular Variation of the Earth's Magnetism. The various magnetic elements suffer from year to year more or less progressive changes which continue for a period the length of which is not known at present; it may be as long as 1500 years or more. It is not even known whether or not the secular change is a strictly periodic one. Suffice it to say that because of this long-period change the earth's magnetic state undergoes such remarkable changes that it is necessary, even for the purely practical purposes of navigation, to issue new magnetic charts of the earth at intervals preferably not longer than five years. The largest annual changes in the compass direction were occurring in 1916 in the following regions: Along the northeastern coast of Brazil, where the north end of the compass was moving westward at the annual rate of about 16′; along the extreme southeastern coast of Africa, where the north end of the compass was moving eastward at the annual rate of about 14′. The largest annual change in the magnetic dip was about 18′ (increase of dip of north end of needle below the horizon), and was occurring in Colombia, South America.

The curves (Fig. 3) represent those described in the course of time by the north end of freely suspended magnetic needles at London, Boston, and Baltimore, the motion being viewed by an observer supposed to be standing at the point of suspension of the needle. It will be seen that the area of the London curve is considerably larger than those of the United States stations, or, in other words, the secular changes in declination and inclination appear to be larger for England than for the United States. However, we do not know what may have occurred in the United States prior to the date when the ob-

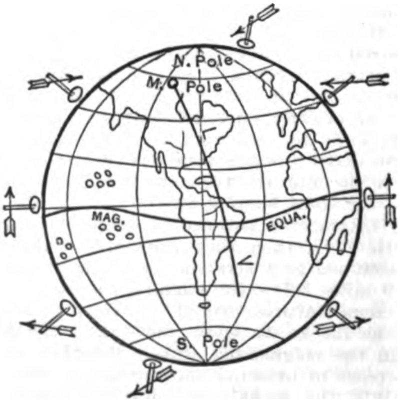
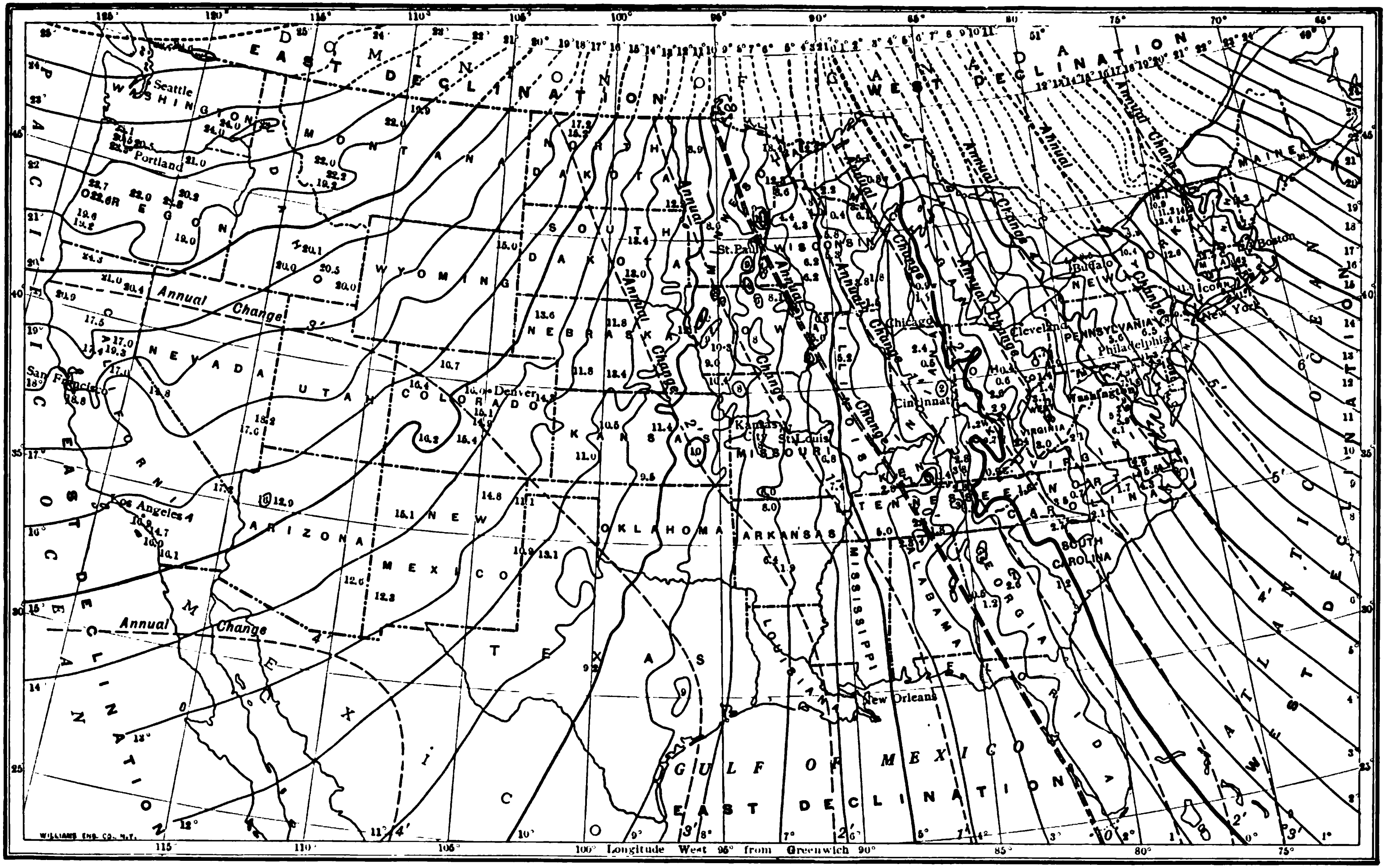


Fig. 2. Showing the direction assumed by a dip needle in various parts of the earth. Some idea of the complexity of the earth's magnetic field is gained by the amount of departure of the magnetic equator from the true equator.

TERRESTRIAL MAGNETISM

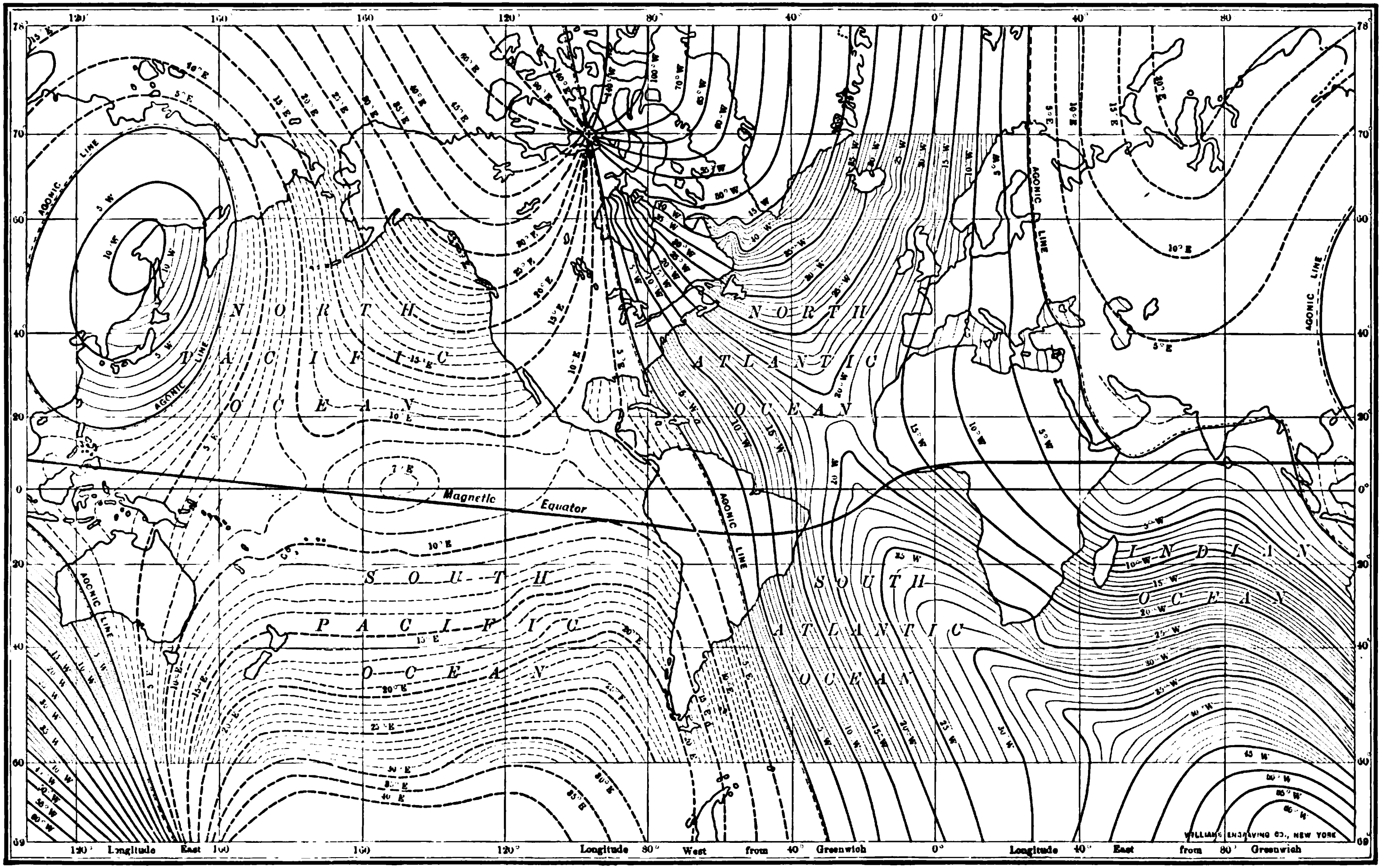


LINES OF EQUAL MAGNETIC DECLINATION AND OF EQUAL ANNUAL CHANGE FOR THE UNITED STATES IN 1915

According to the United States Coast and Geodetic Survey.

The north end of the compass needle is moving to the westward for places east of the line of no change and to the eastward for places west of that line at an annual rate indicated by the lines of equal annual change.

TERRESTRIAL MAGNETISM



LINES OF EQUAL MAGNETIC DECLINATION FOR THE EARTH IN 1915

Based on the United States Hydrographic Office Chart, with additions

Full lines indicate west declination, and broken lines, east declination. The approximate position of the North Magnetic Pole is shown by a +; the heavy line marks the approximate position of the Magnetic Equator servations began, nor can we predict what the future changes will be. For example, the London curve may not close itself, if it ever does, in a simple manner; there may be introduced one or more loops of area smaller than that of the present curve. There is some evidence that such loops may have occurred several centuries ago, and there is no reason why they may not occur again.

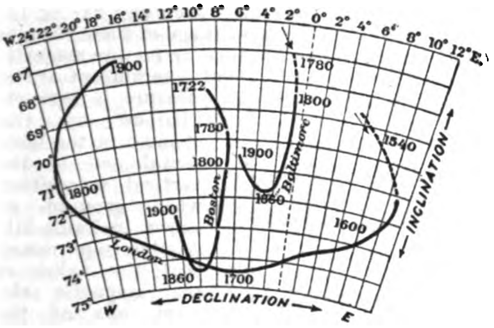


FIG. 3. Curves showing the secular change in the magnetic declination and in the inclination (dip) at London, Boston, and Baltimore. [Drawn for supposed length of freely suspended magnetic needle of about 37 centimeters, or nearly 15 inches.]

Table I shows the irregularities in the secular change from year to year at a typical station, Cheltenham, Md., where a magnetic observatory is in operation under the auspices of the United States Coast and Geodetic Survey.

Magnetic Poles. The approximate position of the north magnetic pole in 1916 was lat. 70° N., long. 97° W., and of the south magnetic pole, lat. 72° S., long. 153° E. A straight line connecting these two poles would pass through the earth 750 miles distant from the centre. We do not possess observations sufficiently extensive, or of requisite accuracy, to determine definitely the paths followed by the magnetic poles as the result of the secular change in the earth's magnetism. Nor do we know as yet the precise cause for this mysterious change. It has been shown, however, that the system of forces causing the changes is a resultant one, composed of a system inside the earth and of another above the earth's surface. It is also known now that the secular change is caused not only by a change in the direction of magnetization but likewise by a change in the intensity of magnetization. The earth's magnetic moment during the past three-quarters of a century appears to have been diminishing at the average annual rate of about $\frac{1}{1400}$ part. But it is not known whether this apparent decrease will continue.

TABLE I

ANNUAL VALUES AND CHANGES OF THE MAGNETIC ELEMENTS AT CHELTENHAM, MD.

(γ denotes 0.00001 of a C. G. S. unit of field intensity)

	DECLINATION		INCLINATION		HOR. INT.	
YEAR	Value	Change	Value	Change	Value	Change
	° ′	′	° ′	′	γ	γ
1902	5 06.8W		70 21.9		20,178	
		3.2W		+0.8		−40
1903	5 10.0W		70 22.7		20,138	
		3.3W		+1.3		−37
1904	5 13.3W		70 24.0		20,101	
		4.5W		+1.4		−37
1905	5 17.8W		70 25.4		20,064	
		3.7W		+1.5		−40
1906	5 21.5W		70 26.9		20,024	
		4.5W		+2.1		−52
1907	5 26.0W		70 29.0		19,972	
		5.1W		+1.5		−50
1908	5 31.1W		70 30.5		19,922	
		5.3W		+2.3		−59
1909	5 36.4W		70 32.8		19,863	
		5.0W		+2.6		−57
1910	5 41.4W		70 35.4		19,806	
		4.2W		+2.0		−61
1911	5 45.6W		70 37.4		19,745	
		4.4W		+1.7		−63
1912	5 50.0W		70 39.1		19,682	
		4.6W		+2.0		−83
1913	5 54.6W		70 41.1		19,599	
		5.2W		+2.9		−89
1914	5 59.8W		70 44.0		19,510	

Diurnal Variation of the Earth's Magnetism. This is one of the most striking of the earth's magnetic phenomena. The magnetic elements run through a certain course having the solar day as period, the ranges of the changes being greater in the summer months than in the winter months, and greater during periods of maximum sun-spot activity than during periods of minimum sun-spot activity. Table II shows the diurnal changes for a typical station, Cheltenham, Md., for a summer month (August) and a winter month (January), and for the year 1912, near the epoch (in 1913) of minimum sun-spot activity. A + sign means motion of north end of compass needle to the east, motion of north end of dip needle downward, and an increase in the horizontal intensity. Thus, at Cheltenham the mean values of the magnetic elements were, in 1912: declination, $D = 5° \ 50.0'$ west; inclination, $I = +70° \ 39.1'$ (+ means north end of dip needle down); horizontal intensity, $H = 0.19702$ (C. G. S. unit). At 8 A.M., on the average in August, 1912, $D = 5° \ 44.7'$ west, $I = +70° \ 40.2'$ $H = 0.19681$. At 1 P.M.,

TABLE II

DIURNAL VARIATION OF THE MAGNETIC ELEMENTS AT CHELTENHAM, MD., IN 1912

(γ denotes 0.00001 of a C. G. S. unit of field intensity)

	DECLINATION		INCLINATION		HOR. INT.	
HOUR	Jan.	Aug.	Jan.	Aug.	Jan.	Aug.
	′	′	′	′	γ	γ
1 A.M.	−0.1	+0.1	+0.1	−0.2	−2	+4
2	0.0	+0.3	+0.1	−0.2	−1	+4
3	+0.3	+0.6	0.0	−0.1	0	+3
4	+0.4	+0.9	0.0	−0.1	+1	+2
5	+0.3	+1.8	−0.1	0.0	+2	+2
6	+0.8	+3.6	−0.1	0.0	+1	+1
7	+1.2	+5.2	0.0	+0.5	0	−8
8	+1.3	+5.3	0.0	+1.1	−1	−21
9	+1.0	+3.3	+0.1	+1.5	−3	−30
10	0.0	−0.5	+0.2	+1.3	−6	−28
11	−1.4	−3.6	+0.2	+0.5	−7	−14
Noon	−2.2	−5.3	+0.2	−0.2	−5	0
1 P.M.	−2.0	−5.6	+0.1	−0.6	−1	+10
2	−1.0	−4.3	−0.1	−0.7	+3	+14
3	−0.2	−2.2	−0.2	−0.5	+5	+12
4	+0.2	−0.4	−0.2	−0.3	+5	+8
5	−0.1	+0.6	−0.1	−0.2	+3	+5
6	+0.1	+0.4	−0.1	−0.2	+3	+5
7	+0.3	−0.1	−0.1	−0.2	+2	+5
8	+0.4	−0.1	−0.1	−0.2	+2	+4
9	+0.3	−0.1	+0.1	−0.3	−1	+6
10	+0.4	−0.2	+0.1	−0.3	−2	+5
11	+0.2	+0.1	+0.1	−0.3	−1	+6
Mid't	−0.1	−0.1	+0.1	−0.3	−1	+6
Range	3.5	10.9	0.4	2.2	12	44

on the average in August, 1912, $D = 5^\circ\ 55.6'$ west, $I = 70^\circ\ 38.5'$ $H = 0.19712$. The turning points (maxima and minima) are indicated in the table by heavy black figures and italicized figures. The ranges (difference between maximum and minimum values) are given at the bottom of the table.

For a year of maximum sun-spot activity the diurnal ranges are, in general, increased, the percentage increase being greater for the winter months than for the summer months. The mean annual ranges at Cheltenham were approximately 30 to 40 per cent greater in the year of maximum sun-spot activity than they were in the year of minimum sun-spot activity.

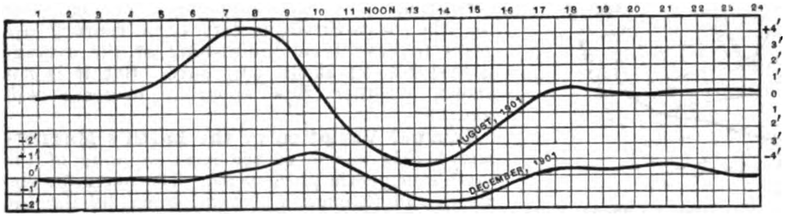


Fig. 4. Showing the diurnal variation of the magnetic declination at Baldwin, Kan., in December and August, 1901.

Confining attention chiefly to the diurnal variation of the magnetic declination (Fig. 4) at an average station in the Northern Hemisphere, we may say broadly that the north end of the compass needle moves eastward in the morning hours until about seven or eight o'clock, and then turns and moves westward until about one o'clock in the afternoon. For an average station in the Southern Hemisphere, the motion just described would be reversed as far as the north end of the compass is concerned, though for the south end it would be the same.

It is seen (Table II and Fig. 4) that the diurnal variation for all the elements is developed chiefly during the daylight hours. The seat of the system of forces causing the magnetic diurnal variation is chiefly above the earth's surface, though a large percentage of the variation arises also from a system situated within the earth.

Acyclic Effect. The diurnal variation is not a strictly cyclic phenomenon, i.e., the mean daily values of the magnetic elements, even on undisturbed days, are not necessarily the same on one day as they were the preceding day or as they will be on the following day. One cause of this is of course the slowly progressing change. But there is a more serious cause for acyclicism, which, if it persisted throughout the year, would give a secular change 10 to 100 times larger than is actually found, i.e., if a pair of consecutive, magnetically calm days be selected, then it is found that the mean daily value of the horizontal intensity on the second day is, on the average for the year, slightly greater than on the first day; this effect is known as the acyclic effect. On the other hand, the general effect of magnetic perturbations, or of magnetic storms, is to diminish the horizontal intensity. Now the magnetically disturbed days outnumber the quiet days at least two to one. The acyclic effect of the nondisturbed days is thus counterbalanced, in a measure, by that of the disturbed days, so that the residual effect at the end of the year is reduced, i.e., at Cheltenham, Md., at present to about 2 or 5 per cent of the regular secular change.

Annual Variation of the Magnetic Elements. Aside from the progressive change throughout the year, caused by the secular variation, the earth's magnetic state undergoes changes varying with the season and having the year as period. The total range of these changes for the magnetic declination, or for the magnetic inclination, is usually about a minute of arc or less. The most instructive feature is best exhibited by the changes in the horizontal and in the vertical intensities, when grouped as shown in Table III. A plus sign means that the value of the magnetic element was at the time numerically greater than its mean value for the year; if the vertical intensity be given the plus sign for the northern magnetic hemisphere, and the minus sign for the southern magnetic hemisphere, then the signs in the table for this element should be reversed for the Southern Hemisphere.

It is evident from this table that the magnitude and signs of the changes depend upon the earth's motion in declination during the year, and that the changes, for the same time of year, are, on the average, of opposite signs in the Northern and Southern hemispheres. The seat of the system of forces giving rise to the annual variations of the magnetic elements is chiefly above the earth's surface.

TABLE III

ANNUAL VARIATION OF THE EARTH'S MAGNETISM

(γ denotes 0.00001 of a C. G. S. unit of field intensity)

MONTHS	NORTHERN HEMISPHERE		SOUTHERN HEMISPHERE	
	Hor. In.	Ver. In.	Hor. In.	Ver. In.
	γ	γ	γ	γ
Nov., Dec., Jan.	−2.1	+2.1	+5.1	−5.7
Feb., Mar., Apr.	−1.4	+3.3	−0.9	+3.9
May, June, July	+5.7	−1.7	−2.7	+0.2
Aug., Sept., Oct.	−2.2	−8.7	−1.5	+1.6
April to Sept.	+2.5	−1.7	−2.6	+0.3
Oct. to March	−2.5	+1.7	+2.5	−0.3

Magnetic Storms and Perturbations. These are sudden, spasmodic changes in the earth's magnetic state, of greater or less severity, occurring quite frequently. They are usually accompanied by displays of polar lights and the generation of electric currents in the earth, sufficiently strong to interfere seriously with transmission of telegraphic signals. (See TERRESTRIAL ELECTRICITY.) During periods of severe magnetic storms, such as occur most frequently near times of maximum sun-spot activity, compasses may be deflected by a whole degree and, at times, by several degrees at places even in medium latitudes. In the polar regions, during such periods, the compass deflection may be many degrees. Magnetic storms in general have a wide area of action and their effects may be felt all over the earth at nearly the same instant of time. Sometimes, however, there are storms, usually less severe in intensity, which may be more restricted in their area of action, e.g., may make themselves felt only in the sunlit region of the globe.

Corresponding Solar and Terrestrial-Magnetic Changes. It has been known for many years that there are changes in the earth's magnetism which run an approximately parallel course with changes in the sun's activity, as indicated, e.g., by sun spottedness. In general, it is found that the ranges of the diurnal changes of the magnetic elements are larger, and magnetic storms are more frequent and more severe during the period of maximum sun-spot development than during the period of minimum development. The magnetic and solar changes here discussed follow approximately the same periods, of which the so-called sun-spot period, 11.4 years, is the chief one; subordinate periods of about 22 and 70 years are also indicated. The correspondence between these magnetic and solar changes is, however, not exact, either as regards time of occurrence or as to magnitude. The epoch of minimum sun-spot activity occurred recently in 1913, while the epoch of minimum magnetic activity of the earth had taken place the year before. Thus we cannot predict from an observed group of sun spots the precise time and severity of a magnetic storm on the earth.

There appears to be some correspondence between certain magnetic changes and changes in the solar radiation, as shown by the solar-constant values observed by the Smithsonian Institution at Mount Wilson, Cal., 1905–15. Neither sun-spot numbers, sun-spot areas, calcium flocculi, solar protuberances, nor solar-constant values, however, may be regarded as fully indicative of the character or magnitude of the agencies responsible directly, or indirectly, for the magnetic changes. It seems probable that the latter are initiated by such solar radiations and emissions (ultra-violet rays, electrically charged particles, etc.), which may ionize the upper atmospheric levels (see TERRESTRIAL ELECTRICITY) and thus cause an alteration in the electric conductivity at these levels. The changes in conductivity in turn may be responsible, in conjunction with the energy of the earth's rotation, for the magnetic fluctuations and magnetic storms associated apparently with solar changes.

Minor Magnetic Fluctuations. Chief among these is the lunar-diurnal variation, having as a period the lunar day, and characterized chiefly by a double oscillation, during 24 hours, like the earth's tides. The range from crest to trough of a single oscillation is usually less than one minute of arc. There is also a magnetic fluctuation dependent upon the moon's declination and phase. Some investigators also believed that they had detected with certainty a small terrestrial-magnetic fluctuation having the sun's rotation as period. The more sensitive the recording instrument, the more evidence is furnished that the earth's magnetic state is in continual flutter. Some of the elemental fluctuations have an amplitude of only a fraction of a minute of arc, or of 0.00001 part of the horizontal intensity, and a period ranging from a fraction of a second to a fraction of a minute. There are also often shown on recording instruments, even of ordinary sensitiveness, more or less rhythmic fluctuations (pulsations) of small amplitude, lasting at times several hours.

Local Disturbances. There are a number of places, distributed over the earth, where, because of local deposits of substances affecting the magnetic needle, the magnetic elements have abnormal values. These local centres of attraction are at times sufficiently intense to cause a compass to point to them and a dipping needle to stand vertical, just as it would at the magnetic poles. Such centres may deflect compasses on board ships several miles away, and cause shipwreck, if the mariner fails to make proper allowance. These phenomena indicate interesting correlations between geological formations and regional disturbances in the earth's magnetic field. Consult Rücker and Thorpe's "Magnetic Survey of the British Isles for 1891," vol. clxxxviii, Series A, *Philosophical Transactions of the Royal Society*, London, 1896.

Instruments and Methods. The limits of this article will not permit detailed descriptions of the most modern instruments used in land and ocean magnetic surveys and at magnetic observatories, nor will it be possible to enter into the latest methods of observation. It must suffice to refer the interested reader to the articles MAGNETOGRAPH, MAGNETOMETER, DECLINOMETER, DIP CIRCLE, COMPASS, and to the references given below.

Solar and Planetary Magnetism. In 1913 it was shown by Hale, of the Mount Wilson Solar Observatory, that the sun, like the earth, is enveloped by a magnetic field. The sun's north magnetic pole is near the sun's true north pole, just as is the earth's north magnetic pole near its true north pole, hence the polarity of the sun's magnetic field is the same as that of the earth. The strength of the solar field, at the magnetic poles, is about 80 times that of the earth's at its poles, which is about 0.65 C. G. S. unit. If the sun at a temperature so high that no substance, as far as we know, could be in a magnetic state, nevertheless possesses a magnetic field, the question arises as to what common cause could give rise to a magnetic field for a hot body, like the sun, and a comparatively cold body, like the earth. The query first raised by Schuster as to whether every large mass rotating with sufficient speed may not be a magnet is one receiving at present much serious attention. If size, density, and angular velocity are sufficient requisites, then there is no reason why every one of our planets, or celestial bodies, may not also be endowed each with a magnetic field. And it may thus transpire that the interacting magnetic effects of the members of our solar system cannot be neglected in astronomy of precision. Even now astronomers are seeking some magnetic cause to account for outstanding motions in the moon, Venus, Mercury, and the sun, which cannot be explained on the gravitation theory alone.

Origin of the Earth's Magnetism. If it should be found possible to prove the existence of a magnetic field for another rotating body, like Jupiter, e.g., then the belief would be greatly strengthened that rotation of a large mass is the chief cause for the observed magnetic field. Unfortunately, the proof as to rotation being the chief cause appears to be beyond present laboratory appliances. There are various facts which point strongly to rotation as being the chief agency involved in the production of the magnetic fields of the earth and of the sun.

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TERRESTRIAL TEMPERATURE. See Temperature, Terrestrial.

TERRIER (OF. *terrier*, from ML. *terrarius*, from Lat. *terra*, earth, land, so called from its scratching the ground in pursuit of prey). A small active domestic dog, used to catch rats. Sixteen distinct breeds are officially recognized, several having two subvarieties—rough-haired and smooth. The earliest authentic mention of the terrier is by Dr. Caius, who wrote a Latin treatise on the dog before 1572. He enumerates among the British dogs "the terrare," described as a hunter of the fox and badger. This breed was what is now called a fox terrier, at that time black-and-tan, or pied with white or yellow, of which a large and a small variety were bred. The larger variety became a rough-haired, strong animal, the foundation stock of the English white terrier. This breed, crossed with the bulldog, produced the bull terrier, a dog of infinite courage, out of which, however, all other bulldog characteristics have been eliminated. The fox terrier was gradually degraded into a fighting dog, and so lost caste that it became nearly extinct, but was revived about 1865, and became the most popular of all terriers as a house pet as well as useful about the stable. While in one direction all the color was being bred out of the original terrier to produce the white dog, in another direction all the white was being eliminated to produce the pure black-and-tan, until that race was perfected. From the smaller specimens of this breed came, by selection, the toy black-and-tan weighing as little as three pounds. The Welsh terrier is a large wire-haired black-and-tan; the Irish terrier is a wire-haired yellow variety, claimed to be indigenous and of the highest antiquity. The Bedlington is a wire-haired variety supposed to be a cross between the low-legged, wire-haired Dandie Dinmont and the otter hound, but it much more strikingly resembles the Irish water dog. The Airedale is a cross of the rough-haired English terrier with the otter hound; and the Boston terrier is a cross of a smooth-coated terrier with the bulldog.

In contrast to the above group of long-legged, short-bodied, up-standing dogs, with either rough or smooth coats, are the long-bodied, short-legged dogs, with a long and silky covering. This latter group were originally developed in northern Scotland. They are the Scotch, a rough wire-haired variety; the Dandie Dinmont with a woollier coat; and the Skyes and Clydesdales with long silky coats. The Yorkshire is the only English specimen of the low-bodied, silky-haired terrier. Japan boasts the shan-tung, which is almost indistinguishable from the Skye; and the Maltese terrier, named from the island, has a coat as long and silky as a Blenheim spaniel.

The characteristics of standard varieties are as follows: The fox terrier is generally lively and of active appearance, with bone and strength in small compass, capable of speed and endurance, and weighing about 20 pounds. The head must be broad between the ears and decreasing in width to the eyes; nose tapering and black; ears V-shaped and drooping forward close to the cheek; jaws strong and muscular; legs straight and strong. The coat of the smooth variety is flat and abundant; of the wire-haired, hard, wiry, and broken. The tail, usually docked, is set on high and carried gayly, but not over the back. The bull terrier is a short-haired terrier, weighing from 15 to 50 pounds, of perfect symmetry, the embodiment of agility, grace, and determination. An all-white coat is most approved, but the American standard permits markings. The tail is left uncropped; in America cropping of the ears is permitted by the standard, but not in England. The black-and-tan is judged in three classes not exceeding 7 pounds, 16 pounds, and 20 pounds respectively. He is a typical terrier, jet black, marked with deep tan as follows: On the head the muzzle must be tanned to the nose, which is black; a bright spot of tan on each cheek, and above each eye; chin, throat, and inside of the ears, and the forelegs up to the knees are tan, with black lines up each toe, and a black thumb mark above the foot inside the hind legs. The Welsh terrier is a wire-haired variety, black or grizzle and tan in color. They are 15 inches high at the shoulder and 20 pounds in weight. The Irish terrier is a wire-haired variety, whole-colored, bright red or wheaten yellow, weighing 24 pounds, active, lively, and lithe—a gamy dog, but with the kindest disposition. The Bedlington is a rough-looking, loosely built dog, with the least general expression of the true terrier. He is 15 to 16 inches high and weighs 24 pounds. His coat is shaggy and usually dark blue. The Airedale, the latest and largest variety, weighing 40 to 45 pounds, is a wire-haired dog, with crown, back, and sides black, and face, throat, and limbs tan; the tail is docked, and the aspect square, trim, and powerful. The Boston terrier is a pet dog of recent creation, which is as much bulldog as terrier, but has lost the wrinkled face and bowed legs of the former, while retaining its brindled markings and screw tail. It weighs 15 to 30 pounds, and is judged in two classes, large and small. The Scotch terrier is a long-barreled, bow-legged, rough-haired dog, weighing from 18 to 20 pounds, with prick ears, and tail carried straight up. This dog has a very sharp, bright, and active expression. His coat is intensely hard and wiry, dense all over his body, and iron gray, grizzly, or black in color, though sometimes sandy. His feet are large, with strong claws, and he is most capable in unearthing vermin. The Dandie Dinmont is from 8 to 11 inches high, weighs from 14 to 24 pounds, and has a mixed coat of hard and soft hair, and a salt-and-pepper color. His ears are long and pendulous. The Skye terrier, a good vermin dog, and built low and long (from 8½ to 10 inches high and 22½ inches long), has two coats, the under one short, close, soft, and woolly, the top one 5½ inches long, hard, straight, flat, and free from crisp or curl. The ears and tail are feathered with long soft hair and the tail is never carried higher than the line of the back. In color it is usually a light blue, gray, or fawn. The Clydesdale, or Paisley, is practically a little Skye with smaller ears, set high and perfectly erect. It is covered with long silky hair, hanging in a fringe down the side of the head. The Yorkshire is also practically a smaller Skye, with a more silky coat. He is judged in two classes, one under 5 pounds and another from 5 to 12 pounds. The Maltese was the lap dog of the Greeks and Romans of the classic period—a small, short-legged dog, not exceeding 6 pounds in weight, with pure white, rather transparent wavy hair, not less than 7 inches long. It is called terrier by its devotees, but it might as reasonably be called a spaniel or toy dog. It has almost if not entirely disappeared from Malta. See Dog and references there given.

TER′RISS, William (1847–97). An English actor, whose true name was William Lewin. Born in London, he studied medicine at Christ's Hospital in that city, later was in the merchant service, and after various adventures made his first appearance as an actor at Birmingham in 1867. Immediately successful, he appeared in the London theatres in the following year as Lord Cloudrays in Robertson's *Society*, and subsequently as Squire Thornhill in Wills's *Olivia* (1878); Chateau-Renaud in *The Corsican Brothers* (1880); and in Shakespearean rôles. He made an American tour with Sir Henry Irving in 1883, and one with Miss Millward in 1889. He was assassinated by a madman. His daughter, Ellaline Terriss, also became well known as an actress, playing with her husband, Seymour Hicks (q.v.). Consult Arthur J. Smythe, *The Life of William Terriss* (London, 1898).

TER′RITO′RIAL WATERS. Waters which are subject to the jurisdiction of a sovereign state as distinguished from the high seas (q.v.). They may be divided into waters lying within the state, waters which are boundaries between states, and waters upon the coast. The law in regard to the first two classes may be definitely stated and is settled. Waters lying within a particular state are subject only to the jurisdiction of that state. When, however, they are the means of communication between two portions of the high seas, such as straits, the Dardanelles, the Bosporus, the Suez and the Panama canals (qq.v.), the regulation of navigation is usually fixed by treaties, but is governed by the principle of international law that they are to be used by all nations for the innocent passage of vessels not of war. Treaties and this principle of international law also govern waters which are within the territory of a particular nation, but which are outlets to the sea, such as the rivers Rhine, St. Lawrence, and the Amazon. In the United States each State exercises jurisdiction over waters lying wholly within the State, unless they form part of the system of interstate waterways, in which case they are subject to the control of the Federal government under the power granted by the constitution. Over waters which are boundaries between two sovereign states, such as lakes, rivers, and narrow bodies of water, jurisdiction is fixed by treaties and is now settled. An imaginary line drawn through the centre of such bodies of water is usually the limit of jurisdiction. Territorial waters on the coast are not clearly defined. The question which most frequently arises is the point on the high seas to which jurisdiction of a state extends. The former theory of international law was that the jurisdiction extended for three miles from low-water mark. This strip along the coast is what is known as the maritime belt, and the theory on which jurisdiction is recognized was based on the cannon shot of the period, but the changed condition of warfare may modify the extent of this territorial jurisdiction. For revenue purposes, for the protection of special industries, such as fishing and other reasons, various limits beyond the three-mile line have been claimed and acknowledged from time to time; e.g., such questions have arisen as to the status of the Bay of Fundy, the bays in Alaska, in the Bering Sea controversy (q.v.). The general rule is that arms of the sea which are not more than 10 miles apart are territorial waters. Claims have been made both by the United States and Great Britain of control over bodies of water with larger openings. The Hague Convention of 1882 adopted 10 miles between headland and headland as the limit. The House of Lords decided that Conception Bay, Newfoundland, was territorial water, although the headlands were 20 miles apart. Chesapeake Bay with headlands of 12 miles apart is conceded to be territorial water. The Hague Convention of 1907 confirmed the law and practice then existing. The subject was to be considered at the next Hague Conference. The questions involved were to be fisheries, the rights of neutral nations in naval warfare, and the jurisdiction of the state over vessels and acts committed upon vessels within territorial waters. In general, it may be stated that in all territorial waters there is a recognized common right of navigation for all nations and especially to the proprietary nation in time of war. The principle of self-protection is recognized by the Hay-Pauncefote Treaty in regard to the Panama Canal, and it is to the interest of all nations to provide the utmost liberty of navigation. A state has always the right to refuse access to armed vessels of other states. Where the coastal line is indented the question arises as to how far bays and other large bodies of water may be considered within the territory of a particular sovereignty. The nature of the sovereignty does not mean ownership, but it is a right of jurisdiction limited to the protection of its coast from the effect of hostilities between other belligerent states, the regulation of fisheries and the prevention of frauds upon the customs and its laws. The authority of a sovereign state cannot extend beyond its boundaries. Its boundary is not the high seas (q.v.), but for purposes of international law is considered as including the maritime belt. It may prevent ships approaching with intent to violate its laws. The exclusive jurisdiction is both civil and criminal over vessels within territorial waters, although concurrent jurisdiction is sometimes given by convention to the state owning the vessel over criminal acts committed on foreign vessels in such waters. It is in consequence of this principle of law that during the Great War vessels of belligerent nations have sought the protection of the harbors and ports of the United States. Such vessels are subject to the jurisdiction of the United States. On the same principle American vessels which have entered the territorial waters of foreign nations are subject to the jurisdiction of those nations. The law of nations requires every national government to use due diligence to prevent a wrong being done within its own territory to any other nation with which it is at peace. The distinction is made between merchant ships and ships of war. A foreign ship of war or any prize of hers within a port of the United States is not subject to local jurisdiction, but a prisoner on board such vessel may be released on habeas corpus issued by the courts of the United States. This, however, is on the ground of international comity and is usually regulated by treaty. The laws of one country are sometimes administered in the territory of another, as in certain established ports in eastern countries known as consular courts. Consult J. B. Moore, *International Arbitration* (6 vols., ib., 1898); F. Wharton, *Digest of International Law of the United States* (2d ed., 3 vols., Washington, 1887); L. Oppenheim, *International Law* (2 vols., London, 1905–06); R. de Villeneuve, *De la détermination de la ligne séparative des eaux nationales et de la mer territoriale* (Paris, 1914). See MARE CLAUSUM.

TERRITORIES (OF. *territorie*, Fr. *territoire*, from Lat. *territorium*, district, from *terra*, earth, land). The name given in the United States to certain parts of the national domain which have not been erected into States. In 1916 they were the District of Columbia, and Alaska on the continent, Porto Rico in the West Indies, and Hawaii, the Samoan Islands, Guam, and the Philippine Islands in the Pacific. They may be classified, under their present status as political bodies, as (1) unorganized Territories; (2) the Federal District; and (3) the insular possessions. In the first class belongs Alaska. Hawaii among the insular possessions has a popularly elected local Legislature of two chambers chosen for a term of two years by a suffrage determined by local law. This legislative power extends to all rightful subjects not inconsistent with the Constitution and laws of the United States, but any law passed is subject to the veto of Congress. The executive power is vested in governors appointed for a term of four years by the President of the United States with the consent of the Senate. The other important officers of the Territory are likewise appointed by the President and are paid from the Treasury of the United States. The Territories are not regularly represented in Congress, but are allowed to send a delegate, who is given a seat in the House of Representatives with a right to take part in the debates, but not to vote. For the Government of Alaska, the District of Columbia, Porto Rico, the Samoan Islands and the Philippine Islands, see separate articles under these titles.

By the United States Constitution the national Congress is given power "to make all needful rules and regulations respecting the territory or other property belonging to the United States." From the beginning this clause was construed as giving the powers incident to jurisdiction as well as to ownership, and even before the adoption of the Constitution the Northwest Territory was regularly organized by the old Confederation Congress, which for this purpose passed the famous Ordinance of 1787. (See NORTHWEST TERRITORIES.) This ordinance served as the model for much of the subsequent legislation in the same field, though there were a number of important variations. Thus, in the organization of the Territories of Tennessee and Mississippi the clause of the Ordinance of 1787 prohibiting slavery was omitted. Of the present States of the United States all, except the original 13 and Vermont, Maine, Kentucky, West Virginia, Texas, and California, have passed through the Territorial stage. Vermont, Kentucky, Maine, and West Virginia were each formed out of territory which belonged to one of the original 13 States, and Texas and California were regularly admitted to statehood without ever having been organized as Territories. The size of many of the Territories, however, differed widely from the size of the States which bear the same names, and there has been a radical changing of boundaries. Thus the Territory of Mississippi originally included Alabama; the Territory of Indiana as organized in 1804 contained all of the Northwest Territory except Ohio; the Territory of Illinois as organized in 1809 included the land now constituting the States of Illinois and Wisconsin, and part of Upper Michigan; the Territory of Michigan after 1834 included all of the territory north of Missouri, Illinois, Indiana, and Ohio, and between Lakes Erie and Huron and the Missouri River; the Territory of Oregon as organized in 1848 covered all the territory of the United States north of lat. 42° N., and west of the Rocky Mountains; Nebraska Territory as organized in 1854 contained land now in Montana, the Dakotas, Wyoming, and Colorado.

The Territorial stage is one of preparation for the Commonwealth status. The Constitution empowers Congress to erect the Territories into States and admit them into the Union whenever it sees fit. Usually when the Territory has a population equal to that of an average congressional district the inhabitants memorialize Congress to pass an "enabling act" empowering them to form a constitution, and prescribing the conditions to be fulfilled. In a number of instances, however, the inhabitants without asking for an enabling act have adopted a constitution and then applied for admission to the Union. As the language of the Constitution is not mandatory, but permissive, the question has arisen as to whether Congress in admitting new States may impose such conditions as it chooses, especially if such conditions were not imposed upon the original States. This was the main question in the Missouri Compromise (q.v.) controversy, since which time Congress has admitted many new States under conditions which were not imposed upon the old States.

After the Spanish-American War the exact status of Territories as compared with the national government and the rights and duties of the national government with regard to Territories again came into controversy. In 1901, however, in the Insular Cases, the United States Supreme Court decided that Congress may freely determine when new Territories are to be incorporated into the Union, can create such forms of government as it sees fit for regions outside the limits of the States, and legislate differently for different parts of the national domain.

TERRITORIES OF FRENCH SUDAN. See MILITARY TERRITORIES OF FRENCH SUDAN.

TERROR, MOUNT. See EREBUS AND TERROR.

TERROR, REIGN OF. See FRENCH REVOLUTION.

TER′RY, ALFRED HOWE (1827–90). An American soldier, born at Hartford, Conn. He studied at the Yale Law School, was admitted to the bar in 1849, and in 1854 was appointed Clerk of the Superior Court of Connecticut. He was a colonel in the State National Guard from

1854 until May, 1861, when he and his regiment entered the service of the Federal government. He participated in the first battle of Bull Run, was mustered out the following month, and in September reëntered the service as colonel of the Seventh Connecticut Infantry. From that time until April, 1864, he was engaged in the military operations along the South Atlantic coast. He was promoted to the rank of brigadier general of volunteers in 1862, and in 1864 he was given command of the Tenth Corps of the Army of the James. In January, 1865, he commanded the second, and successful, Fort Fisher expedition. (See Fort Fisher.) Soon afterward he occupied the city of Wilmington, N. C., which had been the last refuge of the blockade runners. For his services he was commissioned major general of volunteers, and brigadier general and brevet major general in the regular army. From June, 1865, to August, 1866, he commanded the Department of Virginia. He was then placed in command of the Department of Dakota, and in 1876 he commanded the main column which drove Sitting Bull and his followers into Canada after the massacre on the Little Big Horn. Later he commanded the Department of the South and the Military Division of Missouri. He retired in 1888.

TERRY, Benjamin (1857–). An American historian, born at St. Paul, Minn. He graduated from Colgate University in 1878, studied at Hamilton and Rochester theological seminaries, and for several years was a Baptist minister. He was professor of history at Colgate from 1885 to 1892, when he received the degree of Ph.D. at Freiburg and accepted the chair of English history at the University of Chicago. His writings include: *A History of England from Earliest Times to Death of Victoria* (1901), a standard work; *A History of England for Schools* (1903); and articles in periodicals.

TERRY, Charles Sanford (1864–). A British historian. He graduated at Clare College, Cambridge (B.A., 1886; M.A., 1890), and taught at several institutions successively, becoming lecturer in history at Aberdeen in 1898 and professor there in 1903. He published *Life and Campaigns of Alexander Leslie, First Earl of Leven* (1899); *The Rising of 1745* (1900; new ed., 1915); *The Chevalier de St. George* (1901); *The Cromwellian Union* (1902); *The Young Pretender* (1903); *John Graham of Claverhouse* (1905); *The Scottish Parliament* (1906); Craig's *De Unione* (1909), a translation, with notes; and *A Short History of Europe* (3 vols., 1911–15); and *German Sea Power* and *The Growth of Germany's Navy*, in "Oxford War Pamphlets" (1915).

TERRY, Edward O'Connor (1844–1912). An English comedian and manager. He was born in London, and began his career upon the stage in 1863 in Hampshire. In 1867 he made his appearance in London at the Surrey Theatre. Then followed successful engagements at the Strand (1869) and Gaiety (1876) theatres, among his characters being Paul Pry, Little Don Cæsar de Bazan, and Bluebeard. In 1886 he presented at the Olympic Theatre his comedy of *The Churchwarden*. He opened Terry's Theatre in October, 1887, and there, a few months later, produced *Sweet Lavender*, himself playing Dick Phenyl; in this rôle he gave 670 performances. In 1892 he revived *The Magistrate*. In the season of 1897–98 he appeared in *The White Knight*. Terry traveled all over the world. He was much interested in actors' benefit societies.

TERRY, Ellen (Alice) (1848–). An English actress. She was born at Coventry, daughter of Benjamin and Sarah Terry, actors whose talent was inherited by five children. Her first appearance on the stage was as the boy Mamillius in Charles Kean's revival of *A Winter's Tale*, at the Princess's Theatre in 1856. In March, 1863, Miss Terry made her appearance at the Haymarket in London, but after her marriage in 1864 to the painter G. F. Watts, she retired temporarily from the stage. She was later married to Charles Kelly, and in 1907 to James Carew, both actors. In 1875 she joined the Bancrofts at the Prince of Wales's Theatre, where she acted the part of Portia, and in 1876 she played at the Court with John Hare, in Lord Lytton's *The House of Darnley*. Early in 1878 she had a great success in Wills's *Olivia* at the Court. At the end of the same year she began her long association (24 years) with Henry (later Sir Henry) Irving (q.v.) at the Lyceum, as Ophelia to his Hamlet. Earlier, however, she had played with him in *The Taming of the Shrew*. Her most notable rôles during this period were: Portia in *The Merchant of Venice* (1879), probably the most famous of all; Camma in Tennyson's *The Cup* (1881); Juliet (1882); Viola in *Twelfth Night* (1884); Marguerite in *Faust* (1885); Fair Rosamond in Tennyson's *Becket* (1893); Madame Sans-Gêne in a Sardou adaptation (1897); and Clarissa in *Robespierre* (1899). Miss Terry's leading place among English actresses became undisputed. Her later rôles included: Mistress Page in *The Merry Wives of Windsor* (1902); Alice Grey in Barrie's *Alice Sit-by-the-Fire* (1905); Lady Cecily Waynflete in Shaw's *Captain Brassbound's Conversion* (1906); Hermione in *A Winter's Tale* (1906). At various times Miss Terry lectured on Shakespeare's heroines, with impersonations. In 1915, for this purpose, she visited the United States. Her first visit to America as an actress had been made with Irving in 1883, when she won a welcome that was repeated on eight subsequent occasions. A jubilee performance was held in her honor at Drury Lane, London, in June, 1906. In 1913 she published *The Russian Ballet*. Consult, first of all, Miss Terry's own *Story of my Life* (New York, 1908); also William Winter, *Shadows of the Stage* (ib., 1892); Hiatt, *Ellen Terry and her Impersonations* (London, 1898); Clement Scott, *The Drama of Yesterday and To-day* (ib., 1899); id., *Ellen Terry* (New York, 1900); T. E. Pemberton, *Ellen Terry and her Sisters* (ib., 1902). See Terry, Fred; Terry, Phyllis Neilson; Craig, Edward Gordon.

TERRY, Fred (1863–). An English actor manager, brother of Ellen Terry. He was born in London, and married Julia Neilson (q.v.). His first stage appearance was at the Haymarket in 1880. During his career he played in all the principal cities of the United Kingdom, the United States, and Canada. For many years he was in the companies of noted actors. In 1900, with his wife, he assumed the management of the Haymarket, and in 1915 of the Strand. He played at the New Theatre, London, part of each year between 1905 and 1912. For his daughter, see Terry, Phyllis Neilson.

TERRY, Milton Spenser (1840–1914). An American Methodist Episcopal minister, educator, and author. He was born at Coeymans,

N. Y., and was educated at Troy University and at Yale Divinity School. Between 1863 and 1884 he was pastor of churches near New York City. He became professor of Christian doctrine in the Garrett Biblical Institute, Evanston, Ill., in 1885. He published, besides several Bible commentaries: *Biblical Hermeneutics* (1883); *Sibylline Oracles* (1890); *The New Apologetic* (1897); *Biblical Apocalyptics* (1898); *Moses and the Prophets* (1901); *The New and Living Way* (1902); *The Mediation of Jesus Christ* (1903); *The Primer of Christian Doctrines* (1906); *Biblical Dogmatics* (1907); *The Shinto Cult* (1910); *Baccalaureate Sermons and Addresses* (1914).

TERRY, PHYLLIS NEILSON (1892–). An English actress, daughter of Julia Neilson and Fred Terry (qq.v.). She was born in London, made her first stage appearance in *Henry of Navarre* (1909), and played Viola in *Twelfth Night* at the Haymarket in 1910. Subsequently she appeared in the leading rôles of other Shakespearean plays and in a revival of *London Assurance* (1913). She had great success in New York in 1915 in an all-star revival of *Trilby*, taking the title rôle.

TERSCHELLING, tĕr-skĕl′lĭng. One of the West Friesian Islands, in the North Sea, belonging to the Province of North Holland, Netherlands (Map: Netherlands, D 1). Area, about 42 square miles. Pop., 1899, 3929; 1909, 4124.

TERSTEEGEN, tĕr′stā-gen, GERHARD (1697–1769). A German mystic, noted as a hymn writer. He was born at Mörs, was too poor to study theology, and thus remained a ribbon weaver till 1728, after which he devoted himself entirely to religious writing. After his conversion he practiced great self-denial in order to get means to help the poor. His religious ideas are like those of Angelus Silesius and Poiret, but the cast of his theology is Reformed. Besides his *Letters* (1773–75), he wrote *Geistliches Blumengärtlein* (1729; new ed., 1905); *Lebensbeschreibungen heiliger Seelen* (1733–53); and *Geistliche Brosamen* (1769–74). A collected edition of his writings appeared at Stuttgart (1844–45). Consult: Winkworth, *Christian Singers of Germany* (London, 1869); H. E. Govan, *Life of Gerhard Tersteegen, with Selections from his Writings* (new ed., ib., 1902); John Julian, *Dictionary of Hymnology* (rev. ed., New York, 1907).

TERTIAN (tĕr′shan) **FEVER.** See MALARIA.

TER′TIARY (Lat. *tertiarius*, one of the third rank, i.e., after the male and female members strictly belonging to an order, from *tertius*, third). A class in the Roman Catholic church, who, without entering into the seclusion of a monastery, aspire to practice as far as possible in ordinary life the counsels of perfection laid down in the gospel. It reached full development under the organizations founded by St. Francis and St. Dominic. The rules for tertiaries were made public in 1221. The intending members must restore ill-gotten goods, must renounce evil practices, and abandon feuds with their neighbors. Wives cannot be received without the consent of their husbands. The obligation of a tertiary, once accepted, is irrevocable, unless the party should be released, or should enter into a more strict religious life. The members are required to renounce luxury; they must frequent the sacraments; hear mass, if possible, daily; observe the fasts, as well as certain special austerities; and cultivate charity towards all. None of these obligations were supposed to bind the members under pain of mortal sin. Consult Adderly and Marson, *Third Orders* (Oxford, 1902).

TERTIARY SYSTEM. A term applied in geology to the group of rocks included between the Cretaceous and Quaternary systems. It is one of the two periods constituting the Cenozoic era, the Quaternary being the other period. The term Tertiary was first suggested when it was considered that all strata were divisible into three groups, primary, secondary, and tertiary. The first two have been replaced in most localities by other names, but the third is still used, although not with its original significance. The Tertiary is one of the most interesting periods of geological history, presenting most complete sections and a great abundance of organic remains, and yet there has been much difficulty in classifying its different members correctly. The rocks are mostly unconsolidated and have rarely been laid down over great areas, so that in the United States, alone, there are no less than three or four separate regions of Tertiary rocks, in each of which a different series of subdivisions has to be adopted.

Following the European classification, the strata may be divided into four separate series—Eocene, Oligocene, Miocene, and Pliocene—in the order of their occurrence. These main series are recognized in all the Tertiary areas of the United States, of which there are four, viz., the Pacific coast, Western interior, Atlantic coast, and Gulf States. The section in the last-mentioned area is taken as the type.

At the end of the Cretaceous period a great topographic revolution took place in many parts of the world, and at that time the American continent had practically received its present form. The marine Tertiary deposits are found, therefore, chiefly along the borders of the continent, while the interior areas are of fresh-water formation, or perhaps in part æolian deposits. Many of the highest mountain ranges of the world, such as the Alps, Atlas, Caucasus, and Himalaya, were uplifted in the Tertiary period, their height being due to the fact that they are young geologically and consequently have not suffered greatly from erosive agencies.

The life of the Tertiary period presents many similarities to that of the present, although modern types had already begun to appear to some extent in the Cretaceous. In early Tertiary time the climate was very mild over the entire globe, and there was an abundant plant growth far to the north, plants being found in the rocks in many parts of Greenland. A gradual cooling of the climate followed, until at the end of the Tertiary there began the formation of the great continental glaciers that subsequently spread over so much of the temperate zone. The faunal changes that occurred during this period were in many respects remarkable. Of the smaller animals—the ammonites, belemnites, and other molluscan types that swarmed in the Cretaceous—few lived in the Tertiary. The great reptiles had also disappeared, but their place was taken by still more gigantic mammals. The fishes, amphibians, and birds closely resembled modern types.

The Tertiary deposits inclose a variety of economic minerals. In the Cordilleran region many of the metalliferous veins are probably of Tertiary age, as are also some of the bituminous coals and lignites, in this same area, notably in Washington and Oregon. In the Tertiary beds of the Atlantic and Gulf States are many deposits of brick, pottery, and fire clays, while much of the green sand obtained in the Atlantic coastal plain region is of Tertiary age. In Texas deposits of limonite are known in this formation, while in Florida and South Carolina there are great supplies of rock phosphate. Petroleum and asphalt are obtained from the Tertiary deposits of southern California.

Consult: W. H. Dall, "A Table of North American Tertiary Horizons," in United States Geological Survey, *Eighteenth Annual Report*, part ii (Washington, 1898); Chamberlin and Salisbury, *Geology* (New York, 1907–09); Archibald Geikie, *Text-Book of Geology* (4th ed., 2 vols., ib., 1903). See EOCENE EPOCH; GEOLOGY; MIOCENE EPOCH; PALEONTOLOGY; PLIOCENE EPOCH.

TERTUL'LIAN (Lat. *Tertullianus*), QUINTUS SEPTIMIUS FLORENS (born before 160, died after 220). A Latin Church father, the creator of ecclesiastical Latinity. He was born in Carthage, of heathen parentage, and trained for the profession of the law, which he practiced in Rome. Becoming a convert to Christianity about 197–198, he returned to Carthage, where he was made presbyter and spent the rest of his life. About the year 203 Tertullian became a Montanist, and left the Catholic church about 207. He was thenceforth unsparingly severe in his views of ecclesiastical discipline and in his judgments upon the alleged moral laxity of the "psychics," as he called the members of the Catholic church. No other figure in the early Church stands out so distinctly as does this Carthaginian lawyer priest. His intensity of character, alert intellect, blunt speech, keen satire, dialectical skill, moral strenuousness, and bitter partisanship, all combine to render him a marked personality. It was no doubt largely the result of his training that the expression of Tertullian's views was made in such a form as to imprint upon Western theology a legalistic character which it has never lost. He enjoys the further distinction of being the first to formulate in Latin the principles by which Catholic orthodoxy could infallibly be known. His *Prescription of Heretics*, for the clearness with which it enunciates these principles, has not improperly been described as a classic. Were it not for his Montanist errors, Tertullian would rank among the greatest of the Latin fathers. The time and circumstances of his death are unknown; there is no trace of him after about the year 220.

Among his many writings the best known is the *Apology*, written probably in 197. It is a vigorous vindication of the Christians against the attacks and false charges of the heathen world. His polemical zeal was further directed against Jews and heretics, e.g., in his *To the Nations*, *Against the Jews*, *Against Marcion*, *Against the Valentinians*, and *Against Praxeas*, the last named being especially valuable for the history of doctrine. He wrote many tracts on subjects connected with morals and church discipline, e.g., *On Baptism*, *Penance*, *Prayer*, *Patience*, *Idolatry*, and *Shows*. His characteristic strictness comes out even more strikingly in the works written after he became a Montanist, *Women's Apparel*, *The Veiling of Virgins*, *Monogamy*, *The Exhortation to Chastity*, and *Fasting*.

Bibliography. G. A. Simcox, *History of Latin Literature* (2 vols., New York, 1883); C. T. Cruttwell, *Literary History of Early Christianity* (2 vols., ib., 1899); Teuffel-Schwabe, *History of Roman Literature*, translated by Warr (ib., 1900); P. Monceaux, *Histoire littéraire de l'Afrique chrétienne*, vol. i (Paris, 1901); Robert Rainy, *The Ancient Catholic Church* (New York, 1902); Williston Walker, *Great Men of the Christian Church* (Chicago, 1908). The *Works* of Tertullian are published in the *Corpus Scriptorum Ecclesiasticorum Latinorum*, vol. xx (ed. by Reifferscheid and Wissowa, Vienna, 1890; new ed. by A. Kroymann, Tübingen, 1907 et seq.); an English translation is in *The Ante-Nicene Library*, vols. iii and iv (American ed., New York, 1885 et seq.).

TERUEL, tā'rōō-āl'. The capital of the Province of Teruel, in Aragon, Spain, on the left bank of the Guadalaviar, 72 miles northwest of Valencia (Map: Spain, E 2). It is a quaint old town with a handsome Gothic cathedral, a great aqueduct, normal and primary schools, good hospitals and asylums, a library, and a meteorological station. Pop., 1900, 9538; 1910, 11,935.

TERU-TERU, tĕr'ōō-tĕr'ōō. A lapwing plover (*Vanellus cayenensis*) of the eastern part of South America, whose specific characteristics are the long crest and long blunt yellow spur; also its sharp repetitive cry copied in its local name. Its habits on the pampas, where in the breeding season it executes remarkable dances, are described at length by Hudson, who says the bird seems absolutely fearless of man at that period, dashing into his face until it becomes a nuisance. Consult Hudson, *Argentine Ornithology* (London, 1888).

TERZA RIMA, tĕr'tsȧ rē'mȧ (It., rhyme of three). An Italian verse form, of which the first and most notable use was made by Dante in the *Divina Commedia*. Each stanza consists of three hendecasyllabic lines with two rhymes; lines 1 and 3 repeat the middle rhyme of the preceding stanza, and thus the stanzas are closely interwoven. The series or canto necessarily begins and ends with an alternating couplet: a b a, b c b, c d c . . . y z y z. The end of a stanza tends to coincide with a pause in the thought. There is a prevailing inclination to seek the origin of the *terza rima* in the *serventese* (Provençal, *sirventès*). Dante may have invented it as a form symbolically adapted to his poem. Sir Thomas Wyatt, who was much under the influence of Italian models, introduced the stanza into English, choosing it for three satires. Sir Philip Sidney experimented with it in his *Arcadia*, and Milton tried it in a version of the second Psalm. There have been some attempts to preserve the original metre of the *Divina Commedia* in English translation, notably by Byron, who made a version of the Francesca episode in the *Inferno*. Byron's *Prophecy of Dante* is also written in terza rima. The exact replica of the Italian hendecasyllable *verso piano* (which ends with a "feminine" foot: — ◡), such as that recently attempted by John Pyne (*An English Dante*, New York, 1914), is singularly unadapted to the English language. The best English specimen of this difficult stanza is Shelley's *Ode to the West Wind*. Consult: H. Schuchardt, *Ritornell und Terzine* (Halle, 1875); G. Paris, in *Romania*, vol. iv (Paris, 1875); Cassini, *Sulle forme metriche italiane* (2d ed., Florence, 1890); Stengel, "Romanische Verslehre," in Groeber, *Grundriss der romani-*

schen Philologie, vol. ii, part i (Strassburg, 1893); and R. M. Alden, *English Verse* (New York, 1903).

TESCHEN, tĕsh′en (Pol. *Cieszyn*). A town of Silesia, Austria, 63 miles west-southwest of Cracow, on the right bank of the Olsa (Map: Austria, F 2). It was formerly the capital of the Duchy of Teschen. It has manufactories of modules, carriages, clocks, screws, and furniture. There are also breweries, distilleries, flax-spinning mills, and bookbinderies. Teschen is celebrated for the peace, May 13, 1799, which closed the War of the Bavarian Succession. Pop., 1900, 20,454; 1910, 22,540.

TES′LA, Nikola (1857-). An American inventor and electrician, born at Smitjan, Lika, Austria-Hungary. His mother and mother's father were inventors. After studying engineering at the Polytechnic School at Graz and the exact sciences at the University of Prague he worked in the telegraphic engineering department of the Austrian government until 1881, when he became engineer to an electric company in Budapest. In 1884 he came to America, where he was naturalized and at first was employed in the Edison plant at Orange, N. J. Subsequently working at Pittsburgh and elsewhere, he devoted himself to experimental research and invention. He discovered the principle of the rotary magnetic field, applying it in a practical form to the induction motor. Tesla's discovery made possible the alternating current motor and the transmission of power by such current, employing what became known as 2-phase, 3-phase, multi-phase, and poly-phase systems, particularly on long-distance lines, later used extensively. His patents, which were the subject of litigation, were sustained in 1906. Tesla invented many electrical appliances, including dynamos, transformers, induction coils, oscillators, and arc and incandescent lamps, and is principally known for his researches in alternating currents of high frequency and high potential. Tesla's later work dealt with the application of such currents to wireless telegraphy, the transmission of power without wires, and many similar problems. Consult T. C. Martin, *The Inventions, Researches, and Writings of Nikola Tesla* (New York, 1894).

TESLA COIL. See Induction Coil.

TESQUE. See Tanoan Stock.

TESSIN, tĕs-sēn′. The German name of the Swiss Canton of Ticino (q.v.).

TESSIN, tĕs-sēn′, Carl Gustaf, Count (1695-1770). A Swedish statesman, born at Stockholm, son of Count Nicodemus Tessin (q.v.). At 30 he was Ambassador to Vienna. Appointed Prime Minister in 1738, he became spokesman for the "Hat" party. In 1739-42 he was Ambassador in Paris. Under Adolf Fredrik he exerted much influence as Premier, but because he opposed the extension of the King's power he had to resign from office (1752). Tessin was the foremost representative of French culture in Sweden, and one of the most brilliant personages of his time. His literary style is excellent and he was a fine orator. He wrote a daybook of 29 volumes, and *En gammal mans bref till en ung prins* (Stockholm, 1753; Eng. eds., 1755 and 1756).

TESSIN, Nicodemus (1615-81). A Swedish architect, born at Stralsund. In 1646 he became royal architect and in 1674 he was knighted. Among the buildings he erected, many still standing, are: Skokloster, Ekolsund, Strömsholm, Drottningholm (completed by his son, see below), and Borgholm castles, Kalmar Cathedral, his principal work of the sort, and at Stockholm, St. Mary's Church, the Wrangel Palace, and Axel Oxenstierna Palace.

TESSIN, Nicodemus, Count (1654-1728). A Swedish architect and statesman, born at Nyköping, son of Nicodemus Tessin (q.v.). He was educated at Stockholm and Upsala universities, then studied architecture under his father and for four years in Italy under Bernini and Fontana. He became royal architect in 1676. His most notable work, the present Royal Castle at Stockholm, begun in 1697 to replace the palace burned that year, was completed after his death. Tessin finished Drottningholm Castle and built the Auditorium Gustavianum at Upsala, Steninge Castle, his home, and various churches. Several foreign monarchs employed him and he held various honorary offices. He is known as the most distinguished of Swedish architects.

TES′TA. The special protective coat of seeds, which is usually hard, but sometimes (as in certain gymnosperms) develops also a fleshy layer.

TESTA, Gherardi della. See Gherardi della Testa.

TEST ACTS. Numerous acts of the English Parliament imposing religious tests upon persons in public office. The most famous are the Corporation Act of 1661 and the Test Act of 1673. The Corporation Act directed that all magistrates should take the oaths of allegiance and supremacy, as well as an oath renouncing the doctrine that it is lawful to take arms against the King, and provided that they must receive communion according to the rites of the Church of England. The Test Act, so called, imposed the like conditions on the holders of all public offices, civil and military, and obliged them in addition to abjure all belief in the doctrine of transubstantiation. Both of these acts were the result of the struggles against the Catholics in the reign of Charles II. They were repealed in 1828 as regards most of the provisions. See England.

TES′TAMENT (OF., Fr. *testament*, from Lat. *testamentum*, will, publication of a will, from *testari*, to make a will, attest, testify, from *testis*, witness). Literally, a calling upon witnesses. Technically, in Roman law, a will; an act by which a person determines what person or persons shall take his property after his death. The oldest form of testation at Rome was a declaration in the presence and with the sanction of the Roman people in assembly or meeting as an army on the eve of battle. Of the scope and effect of this form of testation little is known. It could, apparently, be employed by patricians only, and it probably affected only such property as did not form part of the household estate (*pecunia* as distinguished from *familia*). In any case, the later Roman testament was developed on a different and independent basis. It started as a sale (*mancipatio*) of the inheritance, and became a secret and revocable instrument, signed and sealed by the testator and seven witnesses. As this mancipation testament is the ancestor of the testament or will in all modern countries, its development is described under Will.

TES′TAMENT, Inofficious. See Inofficious Testament.

TESTAMENTARY, Letters. See Letter.

TESTAMENT OF LOVE, The. A prose work erroneously credited to Chaucer by Speght in the 1598 edition. It was written about the close of the fourteenth century by a prisoner in peril of his life, and modeled on Boethius's *Consolation of Philosophy*, substituting for philosophy Divine Love.

TES'TAMEN'TUM PORCEL'LI (Lat., Last Will of a Little Pig). An amusing Latin skit parodying the legal testamentary forms. It is of unknown authorship, and was written before the fourth century A.D. According to St. Jerome it was a favorite recitation by schoolboys. The text is in Bücheler's smaller edition of Petronius (Berlin, 1886), and is edited with English notes in Peck and Arrowsmith's *Roman Life in Latin Prose and Verse* (New York, 1894).

TESTICARDINES. See BRACHIOPODA.

TES'TIMONY (from Lat. *testimonium*, testimony, from *testis*, a witness). The oral evidence given in a judicial proceeding. This may be adduced either on the trial of an action in court or before an authorized investigation of a committee or commission. The term is popularly used as synonymous with evidence. The latter is an inclusive term. A document is marked in evidence, but the relevant or competent statement of a witness on the stand is testimony. The usual course of the proceedings consists of the direct examination by the producing counsel and subsequent cross-examination by the opposing counsel, and then, if necessary, redirect examination. See EVIDENCE. Consult F. Wellman, *Art of Cross-Examination* (New York, 1903), and F. Wrottesley, *Examination of Witnesses in Court* (rev. ed., London, 1910).

TESTIMONY, ARK OF. See ARK OF THE COVENANT.

TESTIMONY, PSYCHOLOGY OF. There are three groups of problems in applied psychology (see PSYCHOLOGY, APPLIED) which have a bearing upon the nature and weight of certain forms of evidence in legal practice: the report of the witness, the possibility of discovering hidden emotional and ideational complexes from which it may be inferred whether the accused is withholding important facts, and the mental status of the witness or the accused.

Judges and advocates of the courts have long known that a conflict of evidence, in cases where the perceptions and memories of witnesses are concerned, need not mean dishonesty. Experimental psychology has shown that such individual differences must be expected. It remains for applied psychology to determine the variation in range and accuracy of report; the effect of suggestion by way of leading questions; and the degree of accuracy with which an event may be reconstructed from conflicting accounts. The general method employed is to present a group of objects, a picture, or an enacted scene, and after an interval to request the observers to give an account, either by narrative or in response to questions, of what they saw. The results, which are not to be regarded as final, are as follows: errorless reports are the exception (about 2 per cent); the narrative form gives a larger coefficient of accuracy than the interrogatory (90 per cent as against 75 per cent); the range of the latter is much larger (65 per cent as against 40 per cent); as the time interval between presentation and report increases, there is a fairly constant (though slight) decrease both in range and accuracy; children are more suggestible than adults, and their reports are more inaccurate and of less range; both range and accuracy increase with practice; an experienced interpreter can construct an account, from a number of conflicting reports, with an error of less than 1 per cent.

For attack upon the second problem, a method has been devised which takes advantage of the reaction experiment (see REACTION) and the laws of association of ideas (q.v.). The suspect is told that he will be given a word, and that he must reply with the first word that comes to mind. Both the reaction word and the reaction time are recorded. A list of words previously prepared by the experimenter contains critical words, i.e., words that will probably associate to some phase of the crime. The reactor may now betray himself either by the nature of his verbal reaction to a critical word or, in case there is an inhibition, by the increased length of his reaction time. The experiment has proved successful in many instances, and in others it has failed: much work is yet necessary before all the conditions can be brought under control.

Finally, for obvious reasons, it is desirable to know whether a witness or an accused is of normal mind, or is insane, defective, hysterical, etc. Mental tests (q.v.) are employed for this determination; and, so far as regards mental defectives, with good success. A closely related problem, and one that has important psychological bearings, is the prevention of crime. Consult: L. W. Stern, *Beiträge zur Psychologie der Aussage* (Leipzig, 1903–06); Hugo Münsterberg, *On the Witness Stand* (New York, 1908); G. M. Whipple, "The Observer as Reporter," in *Psychological Bulletin*, vol. vi (Baltimore, 1909); C. J. Jung, "The Association Method," in *American Journal of Psychology*, xxi (Worcester, 1910); H. Gross, *Criminal Psychology* (Boston, 1911); O. Lipmann, *Die Spuren interessebetonter Erlebnisse u. ihre Symptome* (Leipzig, 1911); Hugo Münsterberg, *Psychology, General and Applied* (New York, 1914). See CRIMINOLOGY.

TESTING MACHINE. A machine employed for testing and determining the strength of materials used in construction and engineering works. In order to determine the strength of a given material such as the iron or steel used in a boiler or engine, the wood of a building, or brick, stone, cement, etc., it is usual to select small samples and submit them to stresses of varying degrees, from which the characteristics of the material may be learned and various numerical values obtained. With the use of iron and steel in building construction it is found desirable to test beams, columns, and other forms on a large scale often to failure or destruction. Testing machines may depend upon the action of an hydraulic press or of a system of screws and gears by means of which the known force applied can be greatly multiplied by the time it is directly exerted on the piece under test. For many years the testing machine at the Watertown (Mass.) Arsenal enjoyed a unique distinction. Large testing machines are now installed at the laboratories of the United States Bureau of Standards at Washington and Pittsburgh. At Washington there are two machines of the Emery type with capacities of 2,300,000 pounds and 230,000 pounds respectively, while at the Pittsburgh laboratory there is a 10,000,000 pound Olsen testing machine with which tests of full-sized concrete and brick columns have been made. The Riehlé testing machine in smaller sizes is extensively used for structural materials, while for paper, textiles, and other substances special machines and methods are employed. The various tests will be found discussed under Strength of Materials. Consult publications of the American Society for Testing Materials and of the United States Bureau of Standards.

TESTRY, tĕs'trĕ'. A village of France, between Péronne and Saint-Quentin, in the Department of Somme, noted as the scene of a battle (687) in which Pepin of Heristal, the Austrasian Mayor of the Palace, defeated the forces of Neustria and Burgundy, thus bringing the three Frankish kingdoms under his power. See Franks.

TESTS, Mental. See Mental Tests.

TESTU'DINA'TA. The reptilian order Chelonia (q.v.).

TESTU'DO (Lat., tortoise). A device of Roman warfare, by means of which a body of men advanced for assault. The attackers would move in close order, with shields held above their heads, edges overlapping. The effect resembled the shell of a tortoise (*testudo*), and proved an effective protection from weapons of the defenders. A later improvement was the *testudo* machine (on wheels and roofed over), under the protection of which soldiers could destroy or undermine defensive walls. A modified form of the same principle is seen in the flying sap.

TET'ANUS (Lat., from Gk. *τετανός*, spasm, tension, from *τείνειν*, *teinein*, to stretch, strain), or Lockjaw. An infectious disease characterized by tonic spasms of the voluntary muscles, with marked exacerbations. The contractions may be confined to the muscles of the lower jaw (trismus), to certain other groups of muscles, or involve all the muscles of the body. The disease is dependent on a bacillus, discovered by Nicolaier in 1884, and cultivated by Kitasato in 1889. The bacillus is a slender rod, with one rounded end containing a spore, and exists in the fæces of the herbivora and man, and under favorable conditions the spores remain virulent for years. It is found especially in well-manured soil and in dust and surface soil. This accounts for the fact that wounds infected by dust are often followed by tetanus. The organism gains entrance to the tissues often through wounds so slight as to be overlooked. The disease may follow surgical operations or childbirth, infecting the mother through the parturient canal and the child through the cut umbilical cord (trismus nascentium, q.v.). Vaccination wounds are sometimes the port of entry for the bacillus. The microörganism is anaërobic, i.e., it flourishes only in the absence of air or oxygen.

After an injury the disease sets in usually within ten days. Without warning the patient feels a stiffness at the back of the neck, and then in the jaws, so that he is unable to open his mouth widely or to masticate properly. These symptoms continue for a day or two, or the patient may rapidly come to the stage of general rigidity, in which the muscles of the trunk and extremities are affected. The back becomes rigid and arched (opisthotonus); the muscles of the abdomen become hard and board-like; respiratory movements are limited by the rigid muscles. By this time the jaw is firmly closed by contraction of the masseter muscles, and the other muscles of the face drawn into the painful smile known as the *risus sardonicus*. At this stage violent convulsions of the hitherto rigid muscles supervene. During a paroxysm the patient's teeth are tightly clenched, while breathing is in temporary suspension, with imminent danger of death. The spasms are intensely painful, and occur at first at intervals of half an hour or more with gradually increasing frequency. Muscular contractions are sometimes so forcible as to rupture a muscle or break a bone. In untreated cases the end comes in a few days; the paroxysms being more violent and frequent and death ensuing from exhaustion, fixation of the respiratory muscles, or glottal spasm. There may be little fever during the attack, but before death an extraordinary rise in temperature may take place.

The preventive treatment of tetanus is most important. Wounds likely to be contaminated with earth should be opened freely, disinfected thoroughly, with tincture of iodine preferably, and well drained; and a dose of antitetanic serum administered. When these precautions have not been taken and lockjaw sets in, the serum should be promptly injected either into the muscles or spinal canal. Intraspinal injections of magnesium sulphate have cured some patients. Drugs may be given to control the spasms, the most useful of which are chloral hydrate, hyoscine, the bromides, and calabar bean. Chloroform may be necessary during the worst convulsions.

A great many cases of infantile tetanus can be prevented by antiseptic treatment of the stump of the umbilical cord. Tetanus in infants (tetanus neonatorum) is very fatal, being uninfluenced even by antitoxin. Consult article by J. M. Anders in William Osler, *Modern Medicine* (New York, 1915). See Trismus Nascentium.

TETANUS, in Animals. The disease due to the action of *Bacillus tetani* attacks domestic animals, most frequently horses and sheep. It is an acute infectious disease due to an intoxication of the nervous system, characterized by persisting spasmodic contractions of the entire body musculature or of single groups of muscles, without impairment of consciousness. In an acute attack the animal usually dies within four days. The symptoms usually come on gradually, involving most of the muscular structures, which become hard and rigid. The nose is protruded, the limbs move stiffly, the tail is upraised, the bowels are constipated. The sufferer must be kept perfectly quiet, in an airy but comfortably warm place, and plentifully supplied with cold water, and soft, sloppy, but nutritious food, to be sucked in through the firmly closed teeth. In treating the disease it is essential that the seat of infection be thoroughly disinfected at once. The administration of drugs by mouth is dangerous and should not be attempted. The antitetanic serum has given only indifferent results in affected animals, but may be beneficial if administered at the onset of the disease in relatively high doses. Successful results have been reported to follow subcutaneous injection of carbolic acid and the injection of a solution of magnesium sulphate. Horses which receive wounds or upon which surgical operations are performed—in districts where tetanus frequently occurs—may receive a very high degree of protection through the administration of a dose of tetanus antitoxin. Consult: Leonard Pearson and others, *Special Report on Diseases of the Horse*, published by the United States Bureau of Animal Industry (Washington, 1911), and Hutyra and Marek, *Special Pathology and Therapeutics of the Diseases of Domestic Animals* (Amer. ed. from 3d Ger. ed. by Mohler and Eichhorn, Chicago, 1912).

TET′ANY. A form of tonic muscular spasm, affecting especially the muscles of the extremities, most frequently observed during infancy, although it may occur at any age. The principal exciting cause is gastrointestinal irritation, teething, worms, etc., and the disease is commonly associated with rickets (q.v.). During an attack the legs and arms are bent and rigid, the hands, feet, and fingers are tightly flexed. The attack may last only a few minutes, or may be prolonged over hours or days. There is no fever, nor loss of consciousness, and the disease is in itself rarely fatal; the prognosis depending on the associated disorder, to which treatment should be addressed.

TÊTE DE PONT, tāt dē pōɴ (Fr., bridgehead). In modern fortifications a group of works intended to cover one or more bridges, whether permanent or military, so as to prevent the crossing of the enemy, or to enable troops to cross over to the enemy bank, or to permit them to retreat to their own bank. The nature of the works constituting the bridgehead will vary according to the objective. They may be situated two miles or more from the stream whose crossing is in question, with the flanks resting on the river and securely guarded. In other words, a bridgehead under modern conditions is a fortified position rather than a single work. See Fortification.

TETERNIKOV, Feodor. See Sologub, Feodor.

TE′THYS (Lat., from Gk. Τηθύς). In Greek mythology, daughter of Uranus and Gæa, and, by Oceanus, mother of the Oceanids and the river gods.

TET′RABRAN′CHIA′TA. See Cephalopoda.

TET′RACHORD (from Gk. *τετράχορδος*, *tetrachordos*, having four strings, from *τέτρα-*, *tetra-*, four + *χορδή*, *chordē*, string, cord). In music, a system of four tones comprised within the compass of a perfect fourth. The Greek scales were composed by joining two tetrachords. In the Middle Ages the tetrachord was superseded by the hexachord, introduced by Guido d'Arezzo. See Greek Music.

TET′RAD. See Bacteria.

TETRAD′YMITE (from Gk. *τετράδυμος*, *tetradymos*, fourfold, from *τέτρα-*, *tetra-*, four; so called from its frequent occurrence in twin crystals). A mineral bismuth telluride frequently containing sulphur and selenium. It is crystallized in the hexagonal system, has a metallic lustre, and is of a steel-gray color. It is found in Norway, Sweden, and in the United States at various localities in Virginia and North Carolina.

TETRAG′ONAL SYSTEM. See Crystallography, and Plate of Crystal Forms.

TET′RAGRAM′MATON (Gk. *τετραγράμματον*, word of four letters, neut. sing. of *τετραγράμματος*, *tetragrammatos*, having four letters, from *τέτρα-*, *tetra-*, four + *γράμμα*, *gramma*, letter, from *γράφειν*, *graphein*, to write). A term used to designate the name of Israel's God, consisting of the four letters Y H W H. In the Masoretic text it occurs 6823 times and is written with the vowels of Adonai, Lord (originally my Lord), or with those of Elohim, God. By these vowels the reader was warned not to pronounce the divine name, but to substitute for it Adonai or Elohim. On the reasons for this custom, see Jehovah. The Greek version (see Bible) uses *Κύριος*, *Kyrios*, Lord, for the tetragrammaton. The editorial revision of Book II in the Psalter (Psalms xlii–lxxii) also substitutes for it Elohim. There is little room for doubt that the original pronunciation was Yahwe, the final *h* being inaudible. According to Theodoret the Samaritans (q.v.) pronounced the name Ἰαβέ, *Yabe*, or *Yave*, and this statement is borne out by extant Samaritan hymns where the rhyme indicates that pronunciation, and by direct testimony. The same pronunciation is ascribed to a Christian sect by Epiphanius and is found in Egyptian papyri. An Ethiopic manuscript gives the form Yawe, in which the vowels are indicated. The name *Iao* frequently found in manuscripts and papyri goes back to Yahu. That Yahu or Yah existed in Syria as a divine name before the Hebrew invasion is probable and receives some support from Egyptian and Babylonian inscriptions. The fact that Yah occurs chiefly in late Old Testament writings may be due to an archaistic tendency not seldom seen in connection with the liturgy. Yah at the end of a name and Yeho at the beginning meet us so often in preëxilic times that it is likely to be very old. It is also significant that Yahwe never seems to be used in theophorous names. Since it was at all times permitted to pronounce Yahu, it is not strange that the Greeks and Romans should have got the impression that the name of the god of the Jews was *Iao*. The earliest datable occurrence of the tetragrammaton is in the inscription of King Mesha of Moab, c.840 B.C. Through the Samaritans and certain Jewish sects the knowledge of the proper pronunciation was perpetuated. While the Samaritans of the seventeenth century refused to divulge this secret, Sabbatai Zewi (see Messiah), the famous mystic and claimant to the Messiahship, insisted upon the pronunciation of the tetragrammaton. See Jehovah, and consult the works referred to in that article.

TET′RAHE′DRITE (from tetrahedron, so called from the prevailing forms of its crystals). A sulphantimonite of copper, crystallizing in the isometric system, and often occurring in massive forms. It is commonly associated with chalcopyrite (q.v.), massive varieties frequently forming intimate mechanical mixtures; it is also associated with other mechanical sulphides. Tetrahedrite is universally distributed and constitutes an important ore of copper (q.v.).

TET′RAHE′DRON (from Gk. *τέτρα-*, *tetra-*, four + *ἕδρα*, *hedra*, base). A solid bounded by four planes. It appears in nature, and as a crystal is classified as a secondary form of the octahedron, produced by removing the alternate angles or edges of the latter. See Polyhedron.

TETRAL′OGY (from Gk. *τετραλογία*, *tetralogia*, group of four dramas, from *τέτρα-*, *tetra-*, four + *λόγος*, *logos*, word). (1) In Greek drama, a series of three tragedies and a satyric drama presented in sequence. The satyric drama was in some cases connected with the tragedies in subject, but its main purpose was to relieve the tension caused by the trilogy. (2) A musical drama in four parts. Wagner's famous tetralogy, *Der Ring des Nibelungen*, consists of *Das Rheingold*, *Die Walküre*, *Siegfried*, and *Götterdämmerung*. See Trilogy.

TETRAM′ETER. See Versification.

TET′RAPOL′ITAN CONFESSION. See Sacramentarians.

TE'TRARCH (Lat. *tetrarches*, from Gk. *τετράρχης*, governor of a fourth of a country, from *τέτρα-*, *tetra-*, four, fourth + *ἄρχειν*, *archein*, to rule). Originally, the governor of one of four divisions of a kingdom or country; e.g., of Thessaly, according to the arrangements of King Philip, father of Alexander the Great, and of Galatia (q.v.) before it was conquered by the Romans; but, in the usage of the later Roman Empire, any minor ruler, especially in the East, possessing sovereign rights within his territory, but dependent on, and in many cases removable at the pleasure of, the Emperor. This was especially the case in Syria, where the princes of the family of Herod are called indiscriminately by this title (Luke iii. 1) and by that of King (Matt. xiv. 9).

TETRAZZINI, tĕt'rȧ-tsē'nē, Luisa (1874–). An Italian coloratura soprano, born at Florence. Before she was 12 years old she sang without having received instruction, and knew perfectly a number of operas which she had heard her elder sister Eva (later the wife of Cleofonte Campanini (q.v.) practice. After only three months' regular study under Ceccherini at the Liceo Musicale of Florence she made her début as Inez in *L'Africaine* (1895), and then sang in Rome and other Italian cities. Her successes in Russia and Spain secured an engagement for Buenos Aires. From there she went through Mexico to California, whence her fame as a second Patti began to spread (1906). The next year she made a sensation at Covent Garden, and in 1908 Oscar Hammerstein (q.v.) engaged her for his Manhattan Opera House in New York. Subsequently she appeared as guest with the Metropolitan, Boston, and Chicago companies, and also made several triumphant concert tours. A voice of wonderful purity, power, and charm, combined with a faultless technical execution of the most florid and difficult passages, made her indeed the legitimate successor to Patti.

TET'RONAL $(C_2H_5)_2C(SO_2C_2H_5)_2$. A white, crystalline substance similar to sulphonal and, like the latter, used medicinally as an hypnotic. It melts at 85° C. (185° F.) and is but slightly soluble in water. See Sulphonal; Trional.

TETSCHEN, tĕch'*e*n. A town of Bohemia, situated on the right bank of the Elbe, near the Saxon frontier. An active industrial place, having a number of factories and carrying on a lively trade, it is the emporium for the shipping traffic on the Elbe, and forms with Bodenbach practically one town. They are connected by three bridges. The handsome château of Count Thun, built in 1667–73, with a fine park, garden, and hothouses, library, and collection of coins and weapons, was once fortified and a place of some importance in the Seven Years' War. Pop., 1900, 9698; 1910, 10,641.

TETTENBORN, tĕt'*e*n-bôrn, Friedrich Karl, Baron (1778–1845). A German soldier, born in the Principality of Sponheim. He entered the Austrian army in 1794, serving in the wars of the French Revolution. At the battle of Wagram, in 1809, he won distinction by his bravery. Just before the invasion of Russia by Napoleon in 1812 he entered the Russian army as a lieutenant colonel, commanded Kutusoff's vanguard, and greatly harassed the French on their retreat. In 1813 he entered Berlin, together with the Russians, and thence proceeded to Hamburg, which he occupied, but whence he was driven May 30. He next fought against Davout and Pecheux and captured Bremen October 15. He served with Bernadotte in Jutland and on the Rhine in 1814. In France, during the invasion of the allies, he did excellent service in keeping open communications. In 1818 he entered the service of Baden, and in 1819 was promoted to be lieutenant general, and was sent as Ambassador to Vienna, where he died.

TETUAN, tĕt-wän'. A town of Morocco about 38 miles southeast of Tangier, on the Martil. It lies in the midst of fine gardens and is surrounded by dilapidated walls. In the background loom the Rif Mountains. The rows of white houses rise in terraces. The streets are narrow and dirty, but there are many fine residences built by the Moors expelled from Spain. Gun barrels, coarse woolen cloth, slippers, and sashes are manufactured. Grain, fruits, wool, silk, leather, and beef cattle are exported, mainly to Gibraltar. The port, fortified by two forts, is one mile below the town at the mouth of the Martil, and is the only open Mediterranean port in the country. Population, about 25,000, of which 6000 are Jews. Tetuan was the centre of operations in the Spanish-Moroccan War of 1859–60. The city was abandoned by the Spanish in 1862.

TET'ZEL, Johann (c.1460–1519). A German Dominican, famous for his connection with the Reformation through Luther's attacks on his sale of indulgences. He was born at Pirna, in Saxony, and educated at the University of Leipzig, where he graduated in 1487, soon afterward entering the Dominican Order. Being a popular and effective preacher, he was intrusted with the proclamation of an indulgence, first on behalf of the Teutonic Knights from 1503 to 1510, and from 1516 as a subordinate of Albert of Brandenburg, Archbishop of Mainz, on the occasion of the indulgence in favor of contributors to the building of St. Peter's at Rome. In opposition to the preaching of Tetzel Martin Luther published his celebrated theses, on Oct. 31, 1517. Tetzel published a series of counter theses in the following January, and in April a reply to Luther's celebrated sermon on indulgences. In January, 1519, he was called upon to appear before the papal legate Von Miltitz to answer charges made against him, and was severely rebuked for unguarded language and improprieties in procedure. Consult: K. W. Kayser, *Geschichtsquellen über Tetzel* (Annaberg, 1877); Hermann, *Johann Tetzel* (2d ed., Frankfort, 1883); J. B. Röhm, *Zur Tetzel-Legende* (Hildesheim, 1890); N. Paulus, *Johann Tetzel der Ablassprediger* (Mayence, 1899); *Cambridge Modern History*, vol. ii (New York, 1904).

TEUBNER, toip'nẽr, Benedictus Gotthelf (1784–1856). A German bookseller, printer, and publisher. He was born at Gross-Kraussnigk, and became a bookseller at Leipzig in 1811. His house soon grew to be one of the most important in Germany. In 1832 he founded a printing house in Dresden. The firm is best known for cheap, accurate, and scholarly editions of Greek and Latin classics, as well as for scientific publications, especially those of the Saxon Royal Academy.

TEU'CER (Lat., from Gk. *Τεῦκρος*, *Teukros*). The name of two kings in Greek legend. The first seems merely an invented eponymous hero for the *Teucri*, traditionally the early inhabitants of the Trojan plain. He is not mentioned in the early epic, but later is called the son of the river god Scamander and a nymph of Mount

Ida. Another version brought him from Crete. It was said that he gave his daughter, Bateia, in marriage to Dardanus (q.v.), who succeeded him as King. The other Teucer appears in the *Iliad*, and remained a popular figure of legend. He was the son of Telamon, King of Salamis, and Hesione, daughter of Laomedon, King of Troy. He accompanied his half brother Ajax the Greater (see Ajax) to Troy, where he was the best archer among the Greeks, but on his return his father would not allow him to land at Salamis because he had not avenged the death of his brother Ajax, and had not brought back Tecmessa and Eurysaces, her son by Ajax. Teucer sailed for Cyprus, where he founded another Salamis. Cf. Horace, *Carmina*, 1, 7.

TEUFELSBRÜCKE. See Devil's Bridge.

TEUFELSDRÖCKH, toi'fels-drĕk, Herr Diogenes. In Carlyle's *Sartor Resartus*, the eccentric German professor whose speculations on the philosophy of clothes form the vehicle for the satire of the work.

TEUFFEL, toi'fel, Wilhelm Sigismund (1820–78). A German classical scholar, born at Ludwigsburg, Württemberg. He studied at Tübingen, where he became professor of classical philology in 1849. His principal work is the *Geschichte der römischen Litteratur* (Leipzig, 1870; 5th ed., 1890, translated into English by G. C. W. Warr, London, 1891–92; 6th ed., by W. Kroll, F. Skutsch, and others, vols. ii–iii, Leipzig, 1910–13). Teuffel also published *Studien und Charakteristiken zur griechischen und römischen, sowie zur deutschen, Litteraturgeschichte* (Leipzig, 1871; 3d ed., 1889), and *Lateinische Stilübungen,* besides editions of the *Persæ* of Æschylus and the *Clouds* of Aristophanes.

TEUTONES, tū'tō-nēz. A powerful tribe of Germany, dwelling at the mouth of the Elbe. About 120 B.C. the Teutones joined the Cimbri (q.v.) in their migration southward. In 104–102 they remained in Gaul. In 102 they were annihilated by Marius (q.v.) at Aquæ Sextiæ (Aix). See Germania; Teutonic Race. Consult: Clerc, *La bataille d'Aix* (1906); K. Müllenhoff, *Deutsche Altertumskunde*, ii (2d ed., Berlin, 1906); L. Schmidt, *Allgemeine Geschichte der germanischen Völker* (1909).

TEUTON'IC AND SCANDINAVIAN MYTHOLOGY. See Scandinavian and Teutonic Mythology.

TEUTONIC KNIGHTS (The Teutonic Knights of St. Mary's Hospital at Jerusalem). An order of knighthood which originated in a brotherhood formed by German knights in 1190 during the siege of Acre by the Crusaders and recognized by Pope Clement III in 1191. In 1198 this association was changed into an order of knighthood as a balance to the political influence of the Templars and Hospitalers. Hermann von Salza, grand master from 1210 to 1239, saw no future in Palestine, and the order engaged in the conquest of the heathen Prussians, inhabiting the Baltic regions to the northeast of Germany. After a fierce struggle of half a century they completed their subjugation in 1283. Christianity was planted with fire and sword, cities were founded, and the land was colonized by Germans. In 1237 the Teutonic Knights absorbed the order of the Brothers of the Sword, and so acquired Livonia and Kurland. They waged long wars with the Lithuanians for the possession of the territory intervening between these regions and the Prussian country. Early in the fourteenth century they extended their dominion westward, making themselves masters of Danzig and Little Pomerania (Pomerellen). They became a great power and their State prospered, but the Knights themselves remained a ruling aristocracy, and were hated by the conquered natives and Germans alike. In 1410 the power of the Teutonic Knights sustained a great blow through their defeat in the battle of Tannenberg at the hands of the Poles and Lithuanians. In 1466 they were compelled in the Treaty of Thorn to cede West Prussia to Poland and to agree to hold East Prussia as a Polish fief. Half a century later the Knights of the Sword cut loose from the Teutonic Knights, whose dominion was now restricted to East Prussia. In 1525 the grand master, Albert of Brandenburg (q.v.), having embraced Protestantism, laid down his office and converted the State over which he ruled into the hereditary Duchy of Prussia, for which he did homage to the King of Poland. The order was composed of knights, priests, and servants. The rule followed was that of St. Augustine. The insignia were the white mantle and the black cross. After the secularization of the Prussian domain of the Teutonic Knights the order continued to exist in Germany, having numerous possessions, mostly of very small extent, scattered throughout the Empire. Its head resided at Mergentheim (now a town of Württemberg). The order was abolished by Napoleon in 1809, and its possessions were confiscated. It was revived as an Imperial Austrian order in 1834. Its head is an Austrian archduke. Consult: Johannes Voigt, *Geschichte des deutschen Ritterordens* (Berlin, 1857–59); Ernest Strehlke, *Tabulæ Ordinis Theutonici* (ib., 1869); Max Perlbach, *Die Statuten des deutschen Ordens* (Halle, 1890); Johann Loserth, *Geschichte des späteren Mittelalters* (Munich, 1903).

TEUTONIC LANGUAGES (Lat. *Teutonicus*, from *Teutoni*, *Teutones*, an ancient German tribe, connected with Goth. *þiuda*, AS. *þēod*, OHG. *diot*, Ir. *tūath*, country, people), or Germanic Languages. The group of languages of the Indo-Germanic or Indo-European family (see Indo-Germanic Languages) spoken by the Teutonic or Germanic stock. (See Teutonic Race.) It is divided into three main groups: East, North, and West. These three groups were offshoots of a common stock called primitive Teutonic or Germanic, distinguished from other branches of the Indo-Germanic family by the phenomenon of "sound shifting."

East Germanic. This division seems to be entitled to the collective name Vandal. The more prominent East German peoples were the Goths (q.v.), the Vandals (q.v.) (in the narrower sense), and the Burgundians. (See Burgundy.) Of the last-named only scanty linguistic remnants have survived, which are discussed by R. Kögel, in Haupt's *Zeitschrift für deutsches Altertum*, vol. xxxvii (Berlin). Of the language of the Vandals likewise little remains. The remnants of their dialect are treated by Wrede, *Ueber die Sprache der Vandalen* (Strassburg, 1886). The most important of the East Germanic peoples were the Goths. (See Gothic Language.) The Gothic language perished with their empires, except that a last remnant of Goths found an oasis on the Rumanian coast of the Black Sea where the dialect became extinct in the ninth century, except for the Krim or Crimean Gothic which continued to exist as late as the sixteenth century. Our knowledge of Gothic depends almost entirely upon the language of the Visigoths in the Roman provinces of Mœsia and Dacia (Bulgaria and Rumania), as written down by Ulfilas (q.v.). Here the Teutonic dialects assume for the first time literary form.

North Germanic. The four dialects of this group, Swedish, Danish, Norwegian, and Icelandic, show but slight traces of dialectic difference before the eleventh century, as is proved by the evidence of the Norse runes (q.v.). The Scandinavian languages after the eleventh century, however, are divided into East and West Scandinavian, or East and West (or Old) Norse. The eastern division consists of Swedish (including the dialect of the island of Gotland) and Danish; the western division of Norwegian and Icelandic.

West Germanic. Linguistically West Germanic is best divided into Anglo-Saxon or English, Frisian, Low German (Old Saxon), Franconian (or Frankish), and High German.

Anglo-Saxon or English.—There were three main divisions of Anglo-Saxon, the Northern, Midland, and Southern, or also known as Northumbrian, Mercian, and Wessex Anglo-Saxon in the narrower sense. Anglo-Saxon records, which begin with the eighth century, belong almost entirely to the dialect of Wessex. Modern English is properly derived from the dialect of the East Midland or East Mercian division, but as very little material of that dialect has been preserved, it is customary to connect English words with the dialect of Wessex. Northumbrian gave rise to the later Scottish dialect. English proper begins about 1100 when flexional terminations show signs of weakening. This is usually called the Old English period which ended about 1350, when began Middle English ending about 1460. The Modern English period, from the latter date on, is characterized by an almost complete loss of adjective and noun flexions and verb flexions in respect to persons and moods. See ANGLO-SAXON LANGUAGE AND LITERATURE; ENGLISH LANGUAGE.

Frisian.—Frisian is still spoken in Holland, but in general Low German has taken its place. Frisian had originally three dialects, West Frisian in northern Holland, East Frisian between the mouths of the Ems and Weser, and North Frisian northward of the mouth of the Elbe. Old Frisian and the Anglian dialect of Anglo-Saxon are closely related in grammar and vocabulary. See FRISIAN LANGUAGE AND LITERATURE.

Low German (Old Saxon).—Low German speech differs markedly from Anglo-Saxon. The Old Saxon dialects were to the south of the Frisian and east of the lower and middle Frankish, extending over an area roughly corresponding to modern Westphalia, Hanover to Schleswig-Holstein. In its modern continuation Old Saxon is Plattdeutsch. See GERMAN LANGUAGE; PLATTDEUTSCH.

Franconian.—The Franconian or Frankish dialects of the present day in Middle Germany (Middle or Rhenish Franconian, and South or Upper Franconian) differ but little from High German. (See GERMAN LANGUAGE.) The North Franconian, spoken in the Netherlands as late as the sixteenth century, is also called Old Low Franconian. It is continued to the present day in the Dutch of Holland, and in the Flemish of Flanders in Belgium. See DUTCH LANGUAGE; FLEMISH LANGUAGE AND LITERATURE.

High German.—For the character of High German speech, see GERMAN LANGUAGE. The principal modern dialects of High German are the Alemannic, spoken in Alsace, the south of Baden, and parts of Switzerland; the Swabian of Württemberg and western Bavaria, and the Bavarian of Bavaria, parts of Tirol, Salzburg, Austria proper, North Styria, North Carinthia, and other districts of the Austrian Empire.

General Characteristics. The Teutonic languages have developed striking special characteristics which differentiate them from the remaining languages of the Indo-Germanic family. These concern vocalism, consonantism, declension, and conjugation. As regards vocalization the Teutonic treatment of ablaut (q.v.) is peculiar. In the common Indo-Germanic period ablaut was a purely phonetic phenomenon, but in the Teutonic languages, owing to the prevailing loss of the reduplication (q.v.) in the perfect of the verb, and the reduction or loss of endings, ablaut has been adapted to a quasi-grammatical property. Thus the changes of the root vowel in Greek *δέρκομαι*, *δέδορκα*, *ἔδρακον*, are identical with those in German *werde*, *ward*, *geworden*, but in Greek the vocalic changes are not associated consciously with the changes of tense. On the other hand, in the German *ward* the vowel *a* carries the preterite sense of the verb. The prominence of the ablaut has also contributed to analogical spread, and a considerable degree of generalization which has resulted in the six so-called ablaut series comprising the majority of the so-called strong verbs. Some of the types of these series in Gothic are: *beita*, *bait*, *bitum*, to bite; *kiusa*, *kaus*, *kusum*, to choose; *binda*, *band*, *bundum*, to bind. The phenomenon known as umlaut (q.v.), i.e., the assimilation of a given vowel to the vowel of a neighboring syllable, although it rests upon a universal phonetic tendency, is also specially prominent in all periods of the history of Teutonic speech.

Very characteristic is the treatment of the Indo-Germanic lingual and nasal vowels in all Teutonic languages, as *u* + lingual or nasal, giving the groups *ur*, *ul*, *um*, and *un*; e.g., Indo-Germanic **ḷqos*, Skt. *vṛka*, wolf, appears in Gothic as *wulf*; and Indo-Germanic **kṃtom*, Skt. *śatam*, hundred, appears in Gothic as *hund*.

The most characteristic of all Teutonic phenomena is the so-called shift or rotation of consonants, known as Grimm's law (q.v.). A group of apparent exceptions to Grimm's law was explained by Karl Verner. See VERNER'S LAW.

In the domain of noun declension the most important Teutonic phenomenon is the spread of the *n* stems, giving rise to the important distinction between the weak declension (*n* declension) and the strong declension (declensions without *n*). Especially, every adjective may be inflected according to the weak or *n* declension, being then used as the so-called definite form of the adjective in connection with the definite article, in distinction from the indefinite adjective with the indefinite article. The starting point for this is prehistoric. Already in Indo-Germanic times adjectives were substantivized by transition to the *n* declension. A parallel to the double adjective is found in the Balto-Slavic languages, which have produced a definite adjective by compounding the indefinite with the pronominal stem *i̯o-*.

The most important feature of the Teutonic languages in the field of conjugation is the distinction between strong and weak verbs, based in the main upon the different treatment of the perfect. The strong verbs were originally primary; they employed the nonthematic, and very largely reduplicated, perfect of Indo-Germanic times; as Gothic present *wairþa*, I become, perfect *warþ*. The weak verbs were mostly secondary or denominative present stems, which supplied their perfect by a periphrastic form made by fusion of the verb stem with a preterite form of the root *dhē*, to set, as Gothic present *nasja*, I save, perfect *nasida*. Especially in the later periods of Teutonic speech the historical limits of the two classes are effaced. The old type of preterite presents, which are presents in function, also associate with themselves the weak perfect, so that German *weiss*, know (Gothic *wait*, Greek *οἶδα*), forms the weak perfect *wusste*, knew.

Bibliography. Grimm, *Deutsche Grammatik* (new ed., Berlin, 1870–97); Streitberg, *Urgermanische Grammatik* (Heidelberg, 1896); Dieter, *Laut- und Formenlehre der altgermanischen Dialekte* (Leipzig, 1900); Paul, *Grundriss der germanischen Philologie*, vols. i–v (3d ed., Strassburg, 1911–13); Loewe, *Germanische Sprachwissenschaft* (Leipzig, 1905); Hoops, *Reallexikon der germanischen Altertumskunde* (2 vols., Strassburg, 1911–15); Kluge, *Urgermanisch* (3d ed., ib., 1913); Kossinna, *Die deutsche Vorgeschichte* (2d ed., Würzburg, 1914); Kluge, *Etymologisches Wörterbuch der deutschen Sprache* (8th ed., Strassburg, 1915). See also the articles on the various languages of the Teutonic group and the bibliographies there given.

TEUTONIC ORDER. See Teutonic Knights.

TEUTONIC RACE. The name popularly applied to a division of the European peoples, comprising nearly the whole of the population of the German Empire, the Scandinavian countries, the Netherlands, Great Britain, and Switzerland; a large proportion of the people in the United States, Canada, Newfoundland, Australia, New Zealand, and Cape Province; about two-thirds of the inhabitants of Cisleithan Austria; and half the population of Belgium (Flemings). It is also represented by large numbers in Hungary and in the Baltic provinces, Finland, and other parts of Russia, and is found scattered over the whole world. See Europe, Peoples of.

TEUTSCHENBRUNN, John Heumann von. See Heumann von Teutschenbrunn.

TEVERONE, tā′vā-rō′nā. See Anio.

TEWA, tā′wȧ. A group of Tanoan-speaking pueblos in New Mexico. See Tanoan Stock.

TEWFIK (Mohammed) **PASHA,** tū′fīk pȧ-shä′ (1852–92). Khedive of Egypt from 1879 to 1892. He was the eldest son of Ismail Pasha, who secured from the Sultan a firman decreeing the khedival succession to Tewfik instead of his brother Halim. In February, 1879, when the ministry of Nubar Pasha was dismissed (see Egypt), Prince Tewfik became president of the Council, but he, like Nubar, showed too much sympathy with Egypt's European creditors and soon retired. On June 26, 1879, the Sultan deposed Ismail and Tewfik became Khedive, at a time when Egypt was deeply embarrassed financially and the power of the Khedive was much curtailed. His general policy was modern and European, and the year 1880 witnessed the establishment of the dual control of Egypt by England and France. Tewfik soon had to face the rebellion of the Nationalists under Arabi Pasha (q.v.), and Egypt was rescued from anarchy by the intervention of England, which thereby established a controlling influence in the country. Consult F. C. Penfield, *Present Day Egypt* (rev. ed., New York, 1903).

TEWKESBURY, tūks′bēr-ĭ. A town and parliamentary and municipal borough in Gloucestershire, England, on the Avon, 10 miles northeast of Gloucester (Map: England, D 5). The parish church, an ancient and noble Norman edifice, is a noteworthy architectural feature, and is all that remains of a great Benedictine abbey founded in the twelfth century. Tewkesbury is famous as the scene of the battle fought within half a mile of it on May 4, 1471, when the Yorkists under Edward IV and the Duke of Gloucester inflicted a signal defeat on the Lancastrians. Pop., 1901, 5419; 1911, 5260. Consult Blunt, *History of Tewkesbury* (2d ed., London, 1877), and Massé, *Tewkesbury Abbey Church* (ib., 1900).

TEWKS′BURY. A town in Middlesex Co., Mass., 5 miles southeast of Lowell, on the Boston and Maine Railroad (Map: Massachusetts, E 2). It contains the State infirmary. There are extensive horticultural interests, and a chemical factory. Pop., 1900, 3683; 1910, 3750; 1915 (State census), 5265.

TEXARKANA, tĕks′är-kăn′ȧ. The name of two adjoining cities situated on each side of the boundary between Arkansas and Texas, 145 miles southwest of Little Rock; on the Texas and Pacific, the St. Louis, Iron Mountain and Southern, the Memphis, Dallas, and Gulf, the St. Louis Southwestern, and the Kansas City Southern railroads (Map: Texas, E 3). One of the municipalities is the county seat of Miller Co., Ark., and the other is in Bowie Co., Tex. They form, however, practically one industrial community. There are two Federal courts, a county court, two hospitals, a fine post-office building, two city halls, and St. Agnes Academy, besides several handsome residences and business blocks. Texarkana has considerable importance in commerce and manufactures. It is the centre of large timber interests, and ships also cotton, cottonseed oil, and hides. Foundries and machine shops, various plants connected with the cotton industry, large creosoted timber and glass plants, railway shops, cooperages, lumber mills, and furniture, casket, candy, screen, sulphur, mattress, and pottery factories constitute the leading industrial establishments. Pop., Texarkana in Texas, 1900, 5256; 1910, 9790; 1915 (U. S. est.), 12,181; Texarkana in Arkansas, 1900, 4914; 1910, 5655.

TEX′AS. A state in the south-central part of the United States, popularly called the Lone Star State. It is, next to Florida, the southernmost State of the Union, lying between latitudes 25° 51′ and 36° 30′ N., and between longitudes 93° 27′ and 106° 43′ W. It is of an irregular triangular shape with the apex pointing south and a square panhandle extending northward. Its greatest length from north to south is about 800 miles, and its greatest breadth about 750 miles. It is the largest State in the Union, having an area of 265,896 square miles, of which 3498 square miles constitute water surface. Its area is larger than the combined area of the Atlantic States from Maine to Virginia, inclusive.

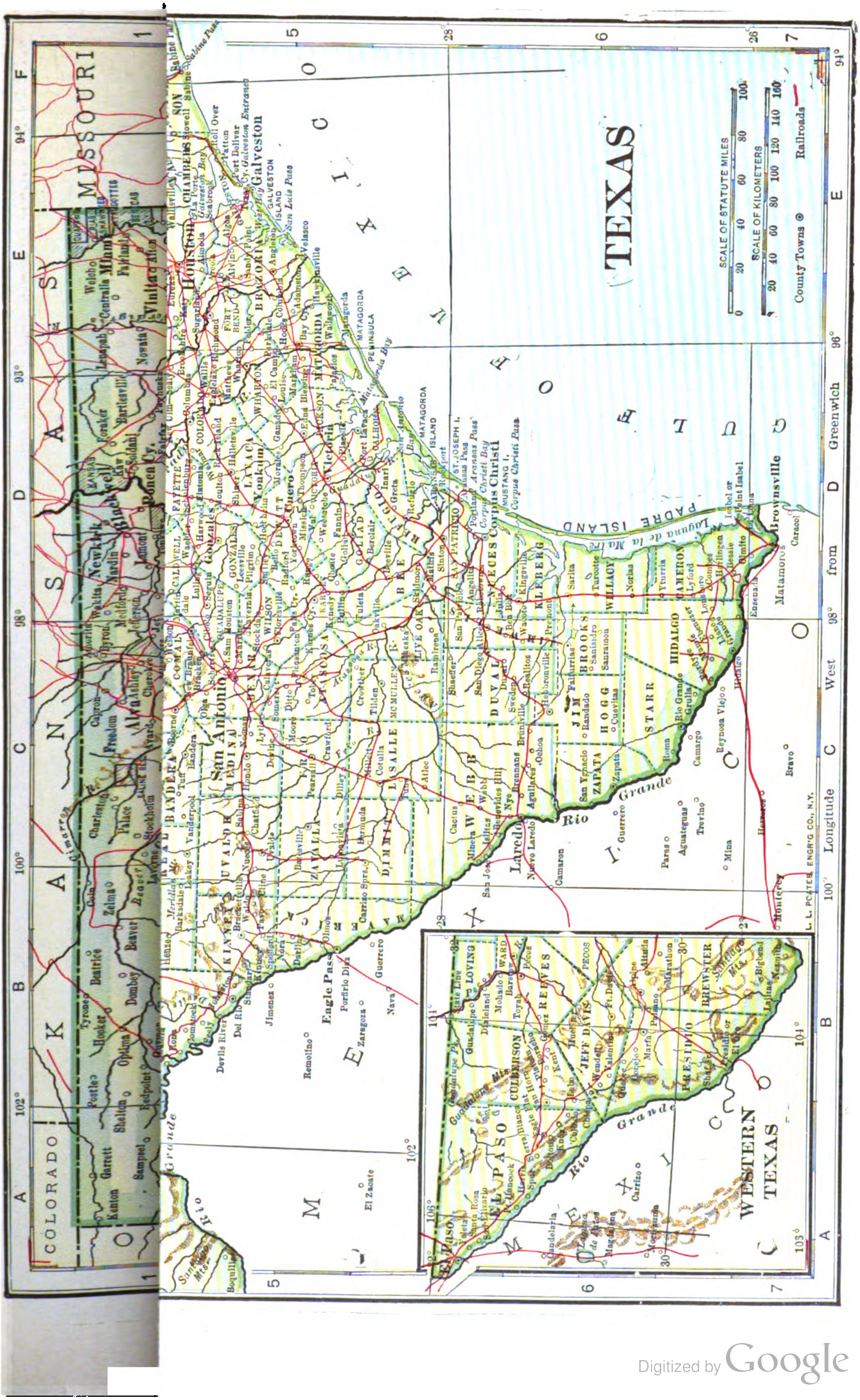
Topography. In general the land rises gradually towards the west boundary by a succession of broad and more or less terraced slopes running parallel with the Gulf coast. Five or six well-marked topographical regions may be distinguished. The first is the coastal plain, a continuation of the same formation in the other Gulf States. It rises gradually from sea level to an altitude of 500 feet about 150 miles inland, and is very level in its lower portion, becoming somewhat hilly near its inner border. The coast itself is lined almost throughout its length of 375 miles by lagoons cut off from the sea by long, narrow sand islands. The northern lagoons generally extend some distance inland in large, irregular bays and estuaries, lined partly by low marshy shores, partly by high bluffs. The principal bays are those of Galveston, Matagorda, San Antonio, and Corpus Christi. The western part of the coastal plain is a belt of rolling country known as the Black Prairie, about 100 miles wide in the north and south, but very narrow in its middle portion. It is succeeded on the northwest by a very broad belt of country called by geologists the central denuded region. This rises from a height of 600 feet in the east to over 2000 feet in the west, being bounded by the escarpment of the Llano Estacado, and is a rugged and much eroded, though not mountainous, region, with ridges, prairie valleys, isolated tablelands, and irregular depressions. It is bounded on the west and southwest by the Plateau Region, a southern continuation of the Great Plains. South of the Panhandle this forms a large, flat-topped table-land, the Llano Estacado, which from an altitude of 4000 feet falls on the east into the Denuded Region in a high, steep, and ragged escarpment cut back by several large river valleys. On the southeast it runs out into a lower plateau of different formations known as the Grand Prairie. This sweeps around the southern end of the Denuded Region, and geologically, and according to some also topographically, it runs northward between the latter and the Black Prairie, though it is here much lower than in the south. It extends southward to the Rio Grande Valley, and is bounded on the southeast by an escarpment. The last topographical region is the portion of the State lying beyond the Pecos River in the southwest. This is a mountainous country with a number of high, isolated, and barren ridges alternating with broad and arid plains. The highest point is Guadalupe Peak, with an altitude of over 9000 feet.

Hydrography. Practically all the rivers of Texas flow southeastward. With the exception of the Canadian River in the north and the Rio Grande with the Pecos in the south, which rise in the Rocky Mountains, all the larger rivers rise on the eastern edge of the Great Plains, the Llano Estacado, and the Grand Prairie. The extreme northern part of the State belongs to the Mississippi basin. The Canadian River crosses the Panhandle to join the Arkansas, while the Red River rises on the escarpment of the Llano Estacado and forms for a long distance part of the northern State boundary. The independent rivers flow directly to the Gulf of Mexico, and all, except the Brazos and Rio Grande, empty through estuaries into the coast lagoon. The principal rivers are the Sabine, on the Louisiana boundary, the Neches, Trinity, Brazos, Colorado, Guadalupe, San Antonio, Nueces, and the Rio Grande. Most of these rivers flow through deep cañons immediately after leaving the Great Plains. Several of them are navigable for considerable distances at high water, but their mouths are generally obstructed by bars.

Soil. The alluvial bottom lands along the lower river courses are the most fertile portions of the State. Next to these ranks the Black Prairie belt, which is covered with a remarkably fertile marl formed by the mixture of clay with the disintegrated Cretaceous limestone. The soil of the coastal plain is generally sandy; in some places the sand is mixed with clay to form a black loam. In the northwest there are heavy deposits of red clay containing much potash, but little nitrogenous matter. The soil on the southern plateau is thin, but the Llano Estacado is covered with a red sandy loam which would be rendered fertile by irrigation.

Climate. As Texas reaches to within two and a half degrees of the tropical zone, it naturally has a warm climate, but the great range in latitude, and to some extent in altitude, produces also a considerable range in climatic conditions. Although warm, the climate is drier and less enervating than that of the other Gulf States. The mean temperature in July at Galveston on the coast is 83.7° F., at El Paso in the extreme west 81.9° F., and at Amarillo in the northwest 76° F. The corresponding figures for January are 52.7° F. at Galveston, 44.5° F. at El Paso, and 31.9° F. at Amarillo. On the coast the temperature seldom falls below the freezing point, while in the northwest it may fall several degrees below zero. In the western uplands, on the other hand, the temperature rises above 100° F., while on the coast the maximum is between 90° F. and 95° F. In winter the State is subject to severe north winds, known as northers, which often lower the temperature 50 degrees in a few hours. In the eastern section the southeast winds from the Gulf are prevalent and bring abundant rain to that part of the State. The rainfall decreases rapidly westward, so that in the western part it is insufficient for agriculture without irrigation. In the eastern portion, near the mouth of the Sabine River, the rainfall is sometimes over 60 inches, while in the extreme south, even near the coast, it is sometimes only 5 inches in a year. The normal annual average at Galveston is 49 inches, at Corpus Christi 30, at Austin 34, at Abilene, nearly in the centre of the State, 25, at Amarillo, in the Panhandle, 22, and at El Paso 9 inches.

Vegetation. The principal forest area of Texas is in the extreme eastern portion. The coast is bordered by marshes and prairies extending 30 or 40 miles inland. North of the prairies in the eastern quarter pines prevail, long-leaf pine in the lower and short-leaf in the higher pine barrens. Westward towards the centre of the State the deciduous species predominate—oaks, elm, maple, hickory, mulberry, sweet gum, ash, and walnut. The Osage orange is common in the black prairie region, and the dwarf palmetto in the eastern part lends a tropical aspect to the vegetation. In the river bottoms the characteristic species are cottonwood, pecan, various oaks, sweet gums, sycamore, ash, and cypress. Along the western border of the Black Prairie two parallel belts of hardwood forest, chiefly oak, and known as


TEXAS
WESTERN TEXAS
SCALE OF STATUTE MILES
SCALE OF KILOMETERS
County Towns
Railroads
Longitude West from Greenwich
GULF OF MEXICO
MEXICO
San Antonio
Houston
Galveston
Corpus Christi
Laredo
Brownsville
El Paso
Rio Grande
KANSAS
MISSOURI
COLORADO
L. L. POATES ENGR'G CO., N.Y.

the Cross Timbers, extend southward as far as the Brazos River. To the south and west of these the State is practically treeless except along rivers. There are scattered areas of scrub and chaparral composed largely of mesquite, the most characteristic tree or shrub of western Texas. Still farther west even the prairie grasses give place to or grow in the midst of a desert flora in which the yuccas and cacti predominate.

Geology and Minerals. The oldest rocks come to the surface in the central denuded region. In the southern part of this region, west of Austin, there is a small area of Archean rock surrounded by a narrow outcrop of Cambrian and Silurian strata. To the north of this there is a considerable area of Carboniferous formation, followed on the northwest, along the eastern base of the Llano Estacado, by a still larger region of Permian rocks. Another large area of Paleozoic and early Mesozoic rocks is found in the Trans-Pecos region, where the predominant formation is Triassic, as in the Panhandle, and of Ordovician, Carboniferous, and Permian, as in the Marathon Plains and in the Glass Mountains. In the westernmost mountainous part of the State there is much Tertiary igneous rock. The Llano Estacado, like the Great Plains to the north, is of comparatively recent formation, consisting of lacustrine Tertiary and Pleistocene deposits. The southern plateau or Grand Prairie region is older, being of Lower Cretaceous formation, and this formation also skirts the central Paleozoic area on the east. It is succeeded on the east by a band of Upper Cretaceous strata constituting the Black Prairie belt. Beyond this the coastal plain is composed to a large extent of marine Tertiary deposits. Workable beds of bituminous coal occur in the central portion of the State, and large deposits of lignite are stretched along the western border of the coastal plain. In the eastern part of the State, near the mouth of the Sabine, petroleum deposits of great extent have been found at a depth of from 600 to 4000 feet. Other oil fields have been developed in Wichita, Clay, Palo Pinto, Shackleford, Navarro, and Williamson counties. Gas has been discovered in San Patricio County. Iron and copper ores, as well as lead and tin, occur in the southeastern part of the central region, and silver is found in the west. The Trans-Pecos region, still but partly explored, probably contains varied mineral deposits, the most important being the cinnabar ores found in the Cretaceous limestone in the south. The most important of the remaining minerals are the immense beds of gypsum found in the Permian strata of the northwestern Red Lands.

Mineral Resources. In 1914 Texas ranked eighteenth among the States in value of mineral products, the value of the total production in that year being $30,363,426. Petroleum is the most important product and the State was fourth in quantity and seventh in value of oil marketed in 1914, the production amounting to 20,068,184 barrels valued at $14,942,848. Fully half of the oil produced comes from the Electra field in the north. Coal is second in importance, Texas being unique among the States in producing considerable quantities of both bituminous coal and lignite. It is believed that about 55,000 square miles are underlain with lignite, while the known bituminous areas measure about 8200 square miles. In 1914 there were produced 2,323,773 tons valued at $3,922,459. Clay products, consisting of common brick, sewer pipe, vitrified brick, pottery, and front brick, hold a prominent position in the State's mineral resources. The production in 1914 was valued at $2,280,987. In 1914 there were produced 2,096,140 barrels of cement valued at $2,686,653. Texas is one of the leading States in the production of quicksilver, upward of 112,500 pounds being produced annually. In the production of asphalt Texas ranks first. This is chiefly residue obtained from the heavy asphaltic oils, though natural asphalt is found in considerable quantities. The manufactured asphalt produced in 1914 amounted to 57,934 tons valued at $608,132. Other minerals produced are gypsum, salt, stone, lead, lime, silver, sulphur, and zinc.

Agriculture. Texas has an approximate land area of 167,934,720 acres, of which 112,434,067 acres were in farms in 1910. The improved land in farms was 27,360,666 acres and the number of farms 417,770, averaging 269.1 acres. The total value of farm property, including land, buildings, implements and machinery, domestic animals, poultry, and bees, was $2,218,645,164. The average value of land per acre was $14.53. Of the total number of farmers in 1910, 198,195 were owners and managers operating 87,155,963 acres, and 219,575 were tenants operating 25,279,104 acres. The native-white farmers numbered 318,988, the foreign-born whites 28,864, and the nonwhite 69,918. The tenants among the whites numbered 170,970 and among the nonwhite farmers 48,605, operating 22,956,867 acres and 2,322,237 acres respectively. Of the foreign-born whites, 10,815 came from Germany, 5236 from Austria, and 1026 from Sweden.

The following table shows the acreage, production, and value of some of the principal crops as estimated for 1915 by the United States Department of Agriculture.

CROPS	Acreage	Production in bushels	Value
Corn	7,450,000	175,075,000	$101,544,000
Wheat	1,475,000	22,862,000	24,462,000
Oats	1,250,000	44,375,000	18,638,000
Potatoes	42,000	2,730,000	2,866,000
Sweet potatoes	60,000	5,880,000	4,116,000
Hay	450,000	*765,000	6,044,000
Cotton	10,200,000	†3,175,000	168,812,000
Rice	260,000	7,930,000	7,058,000

* Tons. † Bales.

In 1909 Texas ranked third among the States in the total value of all crops. This amounted to $298,133,466 and the acreage of all crops reporting such was 18,389,092. In that year the leading crops in order of importance were corn, cotton, cottonseed, hay and forage, rice, kafir corn and milo maize, oats, wheat, and sweet potatoes and yams. Texas is the leading State in the production of cotton. The principal producing counties form a group in the eastern part extending from the Red River to the southern boundaries, but concentrated particularly in the Calcareous prairies. Ellis, Hill, McLennan, Williamson, and Navarro counties are the leading producers. In 1909 the total acreage under cotton was 9,930,179 and the production 2,455,174 bales, valued at $162,735,041. Corn had an acreage of 5,130,052 and a production of 75,498,695 bushels, valued at $50,564,618. The acres of hay and forage harvested in

1909 amounted to 1,311,967, the crop amounting to 1,257,845 tons, valued at $12,824,433. In the production of rice Texas ranks second and, in 1909, 237,586 acres were devoted to it. The production was 8,991,745 bushels, valued at $6,106,323. Kafir corn and milo maize had an acreage of 573,384 and a production of 5,860,444 bushels, valued at $3,785,463. To oats were given 440,001 acres, and the production amounted to 7,034,617 bushels, valued at $50,564,618. The area devoted to wheat was 326,176 acres; the production was 2,560,891 bushels, valued at $2,891,061. The acreage under sweet potatoes and yams was 42,010, and the production 2,730,083 bushels, valued at $2,197,799. Irish potatoes had an acreage of 36,092 and a production of 2,235,983 bushels, valued at $1,825,150. Vegetables other than potatoes and yams had an acreage of 124,690 and a production valued at $8,099,306. Of the small fruits strawberries were most important in value in 1909. The area devoted to small fruits in 1909 was 5053 acres, producing 6,182,742 quarts, valued at $480,331. The most important orchard fruits were peaches, apples, pears, and plums. The value of the total production of orchard fruits was $1,060,998. Texas is noted for its production of pecan nuts, which in 1909 amounted to 5,832,367 pounds, valued at $556,203. Of the tropical fruits raised, figs are the most important; the production in 1909 was 2,411,876 pounds, valued at $97,078. The total value of the sugar-cane products in 1909 was $1,669,683, by far the greater part of which was from sorghum cane. The sirup made amounted to 2,246,774 gallons, valued at $1,106,733.

Live Stock and Dairy Products. Texas is the leading grazing State and ranching is still one of its greatest interests. In 1915 it was far ahead of any other State in the number of neat cattle and of mules; in 1909 ranking second in the total value, $313,164,540, of the domestic animals on farms. The United States Department of Agriculture estimated that on Jan. 1, 1916, there were 1,180,000 horses valued at $92,040,000, 768,000 mules valued at $76,800,000, 1,119,000 milch cows valued at $57,069,000, 5,428,000 other cattle valued at $179,667,000, 2,156,000 sheep valued at $7,977,000, and 3,197,000 swine valued at $24,617,000. The amount of wool produced in 1915 was 9,280,000 pounds. In 1909 the amount of milk produced was reported as 197,039,954 gallons, butter made, 64,993,214 pounds, and cheese made, 194,990 pounds. The total value of milk, cream, and butter fat sold and butter and cheese made in 1909 was $15,679,924. The number of fowls on farms was reported as 13,669,645, and the eggs produced as 62,479,894 dozens, valued at $9,586,114.

Irrigation. The normal rainfall varies from over 50 inches in the east to less than 10 in the west. This is sufficient for the growing of all crops throughout the eastern part and for some crops in the rest of the State. For this reason and because irrigation is not necessary every year, its practice has received less attention than in most of the States west of it. About 50 per cent of the area irrigated exclusive of that used for rice growing is in the valley of the Rio Grande. Irrigation is also common in the valleys of the Pecos and Nueces rivers. The number of farms irrigated in 1910 was 4150 and the area so treated was 164,283 acres out of possible 340,641 acres. The Carey Act does not apply to Texas and neither the United States Reclamation Service nor the Indian Service irrigates any land here. The number of independent enterprises in 1910 was 2161; the total length of ditches was 1663, of which 722 were in laterals. The main ditches had a capacity of 12,818 cubic feet per second. The acreage irrigated per mile of main ditch in that year was 1746.

Forest Products. The estimated area of forest land in Texas in 1908 was about 46,900 square miles. What valuable woods are found occur mostly in the east, though a great part of the timber is hardly fit for anything but firewood. In 1913, 341 active mills reported having cut 2,081,471 M feet board measure. Three or four species of pine make up about 96 per cent of the total lumber output. Next in importance are oak, red (sweet) gum, ash, cottonwood, and cypress. Farms having forest products reported a total value of $8,925,662 in 1910. See *Manufactures*.

Manufactures. The manufactures of Texas depend largely upon the raw materials derived from its stock-raising, agricultural, and mineral-producing activities. In 1909 the State ranked seventeenth in value of products. The gross value per capita in that year was $70. The table opposite gives the more important details for the 10 leading industries and the State as a whole for the years 1909 and 1904.

The slaughtering and meat-packing industry, one of the youngest in the State, had grown in less than a decade from a position of insignificance to be the most important in value of products in 1909. The value of material used in that year was $37,409,785. The number of beeves slaughtered was 527,469, value $15,089,886; calves 234,172, value $2,074,188; hogs 939,674, value $10,933,088. The most important product was fresh beef, of which there were produced 208,016,588 pounds, value $12,408,125. The amount of pork produced was 32,054,404, value $3,195,006. The flour and grist mills produced 3,339,479 barrels of white wheat flour, value $19,110,676, 877,314 barrels of corn meal and flour, value $2,875,994, 280,168 tons of feed, value $7,325,154. Texas ranked seventh in the cut of lumber in 1909, 2,099,130 M feet board measure, of which 2,021,617 M feet were soft woods, the short-leaf yellow pine contributing by far the greater part. See *Forest Products*.

Of the total number of wage earners in 1909, 166,120 were male. The wage earners under 16 years of age numbered 1256, of whom 223 were females. The lumber and timber industry employed the greatest number of people in that year—25,843. For about half the wage earners, the prevailing hours of labor were 60 per week.

Dallas is the largest manufacturing centre. The leading industries as measured by value of products were in 1909 those connected with slaughtering and meat packing, flour and grist milling, cottonseed products, printing and publishing, leather goods, foundry and machine shops. The number of wage earners was 4882, employed in 305 establishments, and the value of products was $26,959,000. Houston ranked second with products valued at $23,016,000. San Antonio was third and had products valued at $13,434,897. Other cities and the value of the products of their industries in 1909 are Fort Worth, $8,660,882; Galveston, $6,308,076; Beaumont, $4,830,591; Waco, $4,769,358. See also under individual titles.

Transportation. Texas is well supplied with both rail and water transportation. There are a number of streams which afford communication to a large area in the east and though navigable only to light-draft vessels, considerable transportation is done by water. Most of the railroad mileage is confined to the more closely settled part of the State, east of a line through Fort Worth, Waco, Austin, and San Antonio. There are several lines crossing the State from east to west, and north-south travel is afforded by numerous roads. The railroads centre about Houston in the south and Fort Worth and Dallas in the north. Texas leads all States in the mileage of railroads. This (excluding siding and yard tracks) in 1914 was 15,569. Some of the principal roads with their mileage in that year are: the Southern Pacific, 2803 (Galveston, Harrisburg, and San Antonio, 1332; Houston, East and West Texas, 191; Houston and Texas Central, 828; Texas and New Orleans, 452); the Atchison, Topeka, and Santa Fe, 2334 (Cane Belt, 108; Concho, San Saba, and Llano Valley, 60; Gulf, Beaumont, and Great Northern, 78; Gulf, Beaumont, and Kansas City, 63; Gulf, Colorado, and Santa Fe, 1145; Gulf and Interstate, 70; Jasper and Eastern, 18; Panhandle and Santa Fe, 125; Pecos and Northern Texas, 570; Texas and Gulf, 95); the Missouri, Kansas, and Texas, 1119; the International and Great Northern, 1106; the Texas and Pacific, 1038; the Colorado and Southern, 745 (Abilene and Southern, 72; Fort Worth and Denver City, 454; Stamford and Western, 83; Wichita Falls and Oklahoma, 23; Wichita Valley, 113); the San Antonio and Arkansas Pass, 724; the St. Louis Southwestern, 695; the St. Louis, Brownsville, and Mexico, 472; the Chicago, Rock Island, and Gulf, 469; the Kansas City, Mexico, and Orient, 465; the St. Louis and San Francisco, 326 (Fort Worth and Rio Grande, 223; Paris and Great Northern, 17; St. Louis, San Francisco, and Texas, 85).

SUMMARY OF INDUSTRIES FOR 1909 AND 1904

THE STATE — TEN LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED IN INDUSTRY		Capital	Wages	Value of products	Value added by manufacture
			Total	Wage earners (average number)	Expressed in thousands			
All industries..............	1909	4,588	84,575	70,230	$216,876	$37,907	$272,896	$94,717
	1904	3,158	57,892	49,066	115,665	24,469	150,528	58,924
Bread and other bakery products	1909	385	2,078	1,391	4,003	671	5,311	2,249
	1904	244	1,198	851	1,276	395	3,049	1,297
Cars and general shop construction and repairs by steam-railroad companies.	1909	62	10,527	9,782	9,362	6,715	13,359	7,813
	1904	47	9,025	8,593	4,599	5,370	10,473	5,997
Flour-mill and grist-mill products	1909	238	1,899	1,216	13,219	669	32,485	3,828
	1904	154	1,430	986	7,785	528	22,083	3,120
Foundry and machine-shop products.	1909	143	3,441	2,925	8,241	1,925	8,068	4,209
	1904	111	2,376	2,080	4,994	1,268	5,179	2,877
Liquors, malt................	1909	12	931	765	7,027	566	6,464	4,769
	1904	10	740	626	5,150	412	4,154	3,059
Lumber and timber products....	1909	799	25,843	23,518	45,552	11,602	32,201	21,197
	1904	391	16,101	14,623	20,452	6,500	18,880	13,925
Oil, cottonseed, and cake.......	1909	194	3,923	3,073	21,506	1,296	29,916	6,477
	1904	157	3,368	2,739	14,180	1,020	18,699	2,894
Printing and publishing........	1909	1,067	7,177	4,408	9,127	2,785	11,587	8,780
	1904	850	5,288	3,444	6,107	2,071	7,830	6,067
Rice, cleaning and polishing.....	1909	19	643	430	3,820	189	8,142	1,020
	1904	17	609	432	2,139	212	4,640	1,132
Slaughtering and meat packing..	1909	14	14,248	3,639	12,438	1,902	42,530	5,120
	1904	9	2,354	2,019	6,375	866	15,621	2,028

Banks. Only one bank was chartered during the life of the Republic of Texas. The constitution of 1845, adopted after the admission of Texas into the Union, prohibited the creation of new banks, the necessary banking business being performed by the one existing bank and by private bankers. When after the Civil War the reconstruction forces came in, a new constitution was adopted which did not have this prohibitory clause, and in 1871 a free banking law was passed. Five or six banks availed themselves of this law, but after the reconstructionists were overthrown and home rule again established, the old prohibitory rule was again included in the constitution of 1875. Because of this prohibition, national banks reached a high degree of development, and their number rapidly increased. The number and condition of the various banks in 1914 is shown in the following table.

ITEMS	National banks	State banks	Private banks
Number	519	789	36
Capital.........	$52,239,000	$20,286,000	$995,020
Surplus.........	26,988,000	4,758,169	284,970
Cash, etc.	21,311,000	564,731	182,524
Deposits........	174,033,000	52,218,506	2,351,108
Loans..........	40,172,000	65,143,936	3,191,221

Government. The present constitution was ratified by the voters in 1876, and has been amended in important details. The Legislature by a vote of two-thirds of all the members may propose amendments to be voted upon by the qualified electors, and these amendments when approved by a majority of the voters become part of the constitution.

Legislative.—The legislative power is vested in a Senate and House of Representatives, which meet biennially. The Senate consists of 31 members. The membership of the House of Representatives must never exceed 150. Senators are chosen for four years, half of whom take office every two years. The members of the House are elected for two years. Senators must be at least 26 years old, and must have resided in the State for five years preceding their election. Members of the House must be at least 21 years of age, and must have resided in the State for two years.

Executive.—The executive department consists of the Governor, Lieutenant Governor, Secretary of State, Comptroller of Public Accounts, Treasurer, Commissioner of the General Land Office, and Attorney-General, all except the Secretary of State being elected by the qualified voters at the same time and places as members of the Legislature. The Governor must be at least 30 years of age, and must have resided in the State for five years preceding his election. He has power to convene the Legislature in extraordinary session, but must state specifically the purpose for which it is convened. The Secretary of State, appointed by the Governor with the advice and consent of the Senate, continues in office during the service of the Governor.

Judiciary.—The judicial power is vested in the Supreme Court, courts of civil appeals, a court of criminal appeals, district courts, county courts, commissioner courts, and such other minor courts as may be provided by law. The Supreme Court consists of a justice and two associate justices, who are elected and hold office for six years. The court of criminal appeals consists of three judges elected by the voters for a term of six years. This court has appellate jurisdiction coextensive with the limits of the State in all criminal cases. The State is divided into districts in each of which is a court of civil appeals. The judges of these courts are elected for six years.

Suffrage and Elections.—Every male of the age of 21 years or over, who has resided in the State for one year next preceding an election and six months within the district or county in which he offers to vote, and every male of foreign birth, who, in not less than six months previous to any election at which he offers to vote, shall have declared his intention to become a citizen of the United States, and who has resided in the State for one year next preceding the election, are deemed qualified voters. Voters are subject to pay a poll tax, those more than 60 years of age, or blind, deaf, or dumb, or permanently disabled are exempt. Primaries are held on the fourth Saturday in July of even years. In the year of a presidential election voters are given the opportunity to signify their preference for President and Vice President at a preferential election held on the first Tuesday in May.

Local and Municipal Government.—The legal subdivision of the State is the county. Cities and towns having a population of less than 5000 inhabitants are chartered by general laws. Cities of more than 5000 inhabitants may by a majority vote of the qualified voters adopt their own charter.

Miscellaneous Constitutional and Statutory Provisions.—All property both real and personal of a wife, owned and claimed by her before marriage, is her separate property. Provision is made for the guaranty of bank deposits by either giving a bond or contributing to a deposit fund. Provision is made for suspended and interminant cases of prisoners, and for parole of convicted persons. The State is under county local option as regards the liquor question and about 87 per cent of the population were under "no license" in 1915.

Finances. The fiscal history of the Republic of Texas was mainly a record of debts, as the strained relations with Mexico demanded greater expense than the taxable property of the young Republic could bear. The issue of loans was stopped only by the inability to float them. An investigation by the Legislature of the State in 1848 ascertained the nominal debt to be $9,647,253, to which the value of $4,807,764 was assigned, as Texas decided to redeem its debt at its actual value when issued. By 1850 the nominal amount and assigned value of the debt were respectively $12,322,443 and $6,818,798. The sum of $10,000,000 which the State received from the Federal government canceled the debt and left a surplus. By 1856 there was no State debt, and the surplus was over $1,000,000. Several loans were made during the Civil War, but the war debt was repudiated by the first reconstruction Legislature. The disarranged condition of the finances necessitated the issue of new bonds in 1870 and the following years. By 1875 there was a debt of $4,644,000, but the overthrow of the reconstruction forces in 1875 caused a radical change in the financial policy of the State. The constitution of that date prohibited any further issue of bonds, except for war purposes, as well as the lending of the State's credit to private enterprises. Because of the difficulty of paying the interest, the debt continued to grow for some time and in 1880 reached its maximum of $5,566,928, after which it steadily declined. On Aug. 31, 1914, the bonded debt amounted to $3,976,200, all of which was held by school, university, agricultural and mechanical college, and the various asylum funds. The income is derived mainly from a general property tax and sale and lease of public land. The total receipts in the fiscal year 1914 were $14,608,344 and disbursements $12,886,344. The cash balance was $1,721,609.

Militia. The males of militia age in 1910 numbered 804,980. The organized militia in 1915 included 181 officers and 2956 enlisted men. It comprised a brigade of three regiments of infantry, a corps of cavalry, a battery of field artillery, and a detachment of sanitary troops with a field hospital.

Population. The population of Texas by decades since its admission into the Union is as follows: 1850, 212,592; 1860, 604,215; 1870, 818,579; 1880, 1,591,749; 1890, 2,235,527; 1900, 3,048,710; 1910, 3,896,542; 1915, (estimated) 4,343,710. The State ranked fifth in 1910. The density per square mile was 14.8, and the urban population 938,104. There were 2,017,626 males and 1,878,916 females. In that year the whites numbered 3,204,848, the negroes 690,049, and the Indians 712. The white population of foreign birth numbered 239,984. Of the latter Mexicans were the most numerous with 124,238; Germans numbered 44,917, and Austrians 20,566. The number of natives born in other States was 923,847. Those coming from Tennessee led in numbers with 134,702, Alabamans, Mississippians, and Arkansans following in order mentioned. The males of voting age numbered 1,003,357 whites and 166,398 negroes. The leading cities with their populations in 1910 and as estimated for 1915 are: San Antonio, 96,614 and 119,447; Dallas, 92,104 and 118,482; Houston, 78,800 and 108,172; Fort

Worth, 73,312 and 99,528; El Paso, 39,279 and 51,936; Galveston, 36,981 and 41,076; Austin, 29,860 and 34,016; Waco, 26,425 and 32,756.

Education. The chief educational problem in Texas lies in handling satisfactorily the rural-school situation in sparsely settled communities. Coupled with this there is the problem of a comparatively large colored population. A large decrease in the percentage of illiteracy in the decade for 1900 and 1910 indicated a considerable improvement in general conditions. In 1910 there were 288,904 illiterates of ten years of age or over, comprising 9.9 per cent of the entire population; among whites of native parentage there was a percentage of 3.3 per cent; among negroes the percentage of illiteracy was 24.6 per cent. The total school population according to the thirteenth census was 1,363,713; of these 793,796 attended school, of which 582,995 were native whites, and 130,708 were negroes. The total number of children over seven and under 17 years of age Sept. 1, 1913, the latest date for which statistics are available, was 1,048,570, according to the report of the State Superintendent of Schools. Of these, 840,130 were white, and 208,440 were colored. The State available school fund in 1913 was proportioned among the school population at the rate of seven dollars per capita, amounting in all to $7,339,990. To this amount should be added $5,899,619.96 raised through local taxation and $1,143,865.03 received from other sources, making a total expenditure of $14,383,968.04 or $13.71 per capita for public education in Texas for the year 1913–14. There were 249 counties receiving State apportionment. Each county has a county superintendent and a school board. The Legislature of 1915 enacted a compulsory attendance law. It also passed a law establishing a county board of education. The normal schools are the West Texas Normal School at Canyon City, the North Texas Normal College at Denton, the Sam Houston State Normal College at Huntsville, the Prairie State Normal and Industrial College for colored persons at Prairie View, and the Southwestern State Normal School at San Marcos. Other State institutions are the State University at Austin, the Agricultural and Mechanical College of Texas at College Station, the State Medical College at Galveston, and the College of Industrial Arts. Other institutions of collegiate rank are: Simmons College at Abilene, Howard Payne College at Brownwood, Polytechnic College at Fort Worth, Texas Christian University at Fort Worth, Southwestern University at Georgetown, Westminster College at Tehuacan, Baylor University at Waco, and Trinity University at Waxahachie. These are all coeducational. Colleges for men only are St. Louis College at San Antonio, and Austin College at Sherman. Colleges for women are the Baylor Female College at Belton, the North Texas Female College at Sherman, and Asgard College at South Houston.

Charities and Corrections. The charitable and correctional institutions under the control of the State include the State penitentiaries at Huntsville and Rusk, the State Lunatic Asylum at Austin, the North Texas Hospital for the Insane at Terrell, Southwestern Insane Asylum at San Antonio, State Orphans' Home at Ersicana, State Epileptic Colony at Abilene, Deaf and Dumb Institute, State School for the Blind, Confederate Home, the Women's Confederate Home, and the Deaf, Dumb, and Blind Institute for Colored Youth, all at Austin, State Juvenile Training School at Gatesville, the State Tuberculosis Sanitarium at Carlsbad, and the Girls' Training School at Gainesville. The last mentioned institution was opened in 1915.

Religion. The Baptists are numerically the strongest church, followed closely by the Methodists and Roman Catholics. These three bodies together contain considerably over three-fourths of the church membership. The Disciples of Christ (Christian), Presbyterians, and Lutherans are the only other Protestant sects numerically important.

History. The first Europeans to tread the soil of Texas were probably Cabeza de Vaca and three other survivors of the Narváez expedition of 1528. (See NÚÑEZ CABEZA DE VACA.) Cabeza de Vaca's account of his wanderings through Texas stimulated Mendoza, the Viceroy of Mexico, to send a party northward under Friar Marcos de Niza to search for the mythical Cibola or Seven Cities, rumored to be golden as Mexico. It returned empty-handed, as did an expedition led by Vásquez de Coronado (q.v.). Several other expeditions probably penetrated Texas during the next hundred years, notably those of Espejo in 1582, Sosa in 1590, and Governor Oñate of New Mexico in 1601 and in 1611. An entrada in 1650, led by Capt. Hernán Martín and Diego del Castillo, is said to have reached the Tejas (Texas) tribe of Indians in the region of the Neches and Sabine; one in 1684 under Padre Nicolás López and Capt. Juan Domingo de Mendoza crossed the Rio Grande into the Pecos country. The first town in the State, lying 12 miles north of El Paso, was founded in 1682 and called Taleta.

The history of the State practically begins in 1685 with the landing of La Salle (q.v.), and though his attempt at colonization ended in failure, the Spaniards took fright, fearing that France might seize the land. In 1690 Alonzo de León and Padre Manzanet were sent to found a mission in that quarter, which was to serve the double purpose of holding the country and of converting the natives to Christianity. Mission San Francisco de los Tejas was accordingly founded among the Tejas Indians not far from the Neches River. The next year another expedition came out under Teran, but nothing resulted, and for years after Teran's entrada there was no further colonizing by Spaniards. French activity in Louisiana roused them, and in 1714 Juchereau de Saint-Denis, a bold French trader, led an expedition across the country to the Rio Grande, where he was made prisoner and sent to Mexico City. His account of Texas fired the Viceroy and Council to renewed efforts. In 1716 Capt. Domingo Ramón was chosen to lead an expedition which founded several missions. He settled San Antonio de Bejar, which in the course of time became the centre of the most prosperous group of missions in the Province of Texas, as it was now called.

For a half century mission founding went on, but it became apparent that failure was certain. Many establishments were abandoned, and some were moved about in the wilderness. The Indians destroyed more than one mission. When, in 1763, France surrendered Louisiana to his Catholic Majesty, the prime reason for the occupation of Texas no longer existed, as there could be no further French aggression from Louisiana. So the missions near the Neches and Sabine were abandoned and only those about San Antonio de Bejar—Alamo, Concepción, San José, Espada—showed signs of surviving. There came in time to be three main foci of settlements—at Nacogdoches in the east; at what is now Goliad in the south; and at San Antonio de Bejar in the southwest. The latter overshadowed the others in importance.

In 1799 Philip Nolan, an American, invaded the country from Louisiana with a small party for the ostensible purpose of purchasing horses. Two years later on a second expedition the Spaniards attacked the adventurers, killing some and sending the rest to Mexican mines. This was the beginning of the end of the Spanish régime. After the purchase of Louisiana in 1803, the people of the United States, and especially the inhabitants of the Southwest, looked on Texas as part of the destined dominion of the Republic and never lost an opportunity to strike at the Spanish power. In 1806 it looked as though war must result with Spain over the possession of the region. The United States claimed westward to the Rio Grande on the strength of the French occupation; Spain as stoutly disputed the claim, and in October, 1806, armies of the two powers stood facing each other across the Sabine. However, Gen. James Wilkinson, who commanded the Americans, was glad of the opportunity given him by the retreat of the Spaniards to the west of the Sabine and by the excitement attending the rumored conspiracy of Aaron Burr to make a neutral ground treaty with the opposing commander, Herrera, which practically conceded to Spain the territory west of the Sabine.

In 1810, when the great revolution in Mexico against Spain had begun, the Southerners sympathized intensely with the natives, and before very long were lending secret aid to Mexico. A filibustering expedition into Texas was led by James Long, a Natchez merchant and ex-officer in the United States army. At Nacogdoches Texas was declared a republic and a provisional government organized; but the Spanish forces soon broke it up. For several years the coast of Texas became a rendezvous for pirate and adventurer. Louis de Aury, Captain Perry, General Mina, and Lafitte are best known. They made Galveston Island their headquarters. From here Mina sailed on his expedition against the Spaniards in Mexico; and from here Lafitte the pirate scoured the Gulf till the United States government broke up the settlement. The early years of the nineteenth century witnessed the expiration of the Spanish power in Texas. What with the filibustering expeditions and hostile Apaches and Comanches, and the struggle for independence in Mexico, the Spanish foci of civilization were nearly extinguished. When the harsh Spanish law which forbade the entry of Americans into the region could no longer be enforced, frontiersmen from Kentucky, Tennessee, and Louisiana wandered in with their families and remained.

In 1821 Moses Austin secured from the Mexican government the right to establish a colony in Texas. He died soon after, but his son Stephen took up the work. Being free to choose the location for his colony, Austin selected the lower Brazos and Trinity valleys. Before long many empresarios had been granted, covering with claims the region from the Sabine to the Nueces. Discontent with the Mexican rule was not long in appearing. This reached a crisis on Dec. 16, 1826. The struggle which ensued is known as the Fredonian War. A band of dissatisfied Americans, headed by Benjamin Edwards, proclaimed the eastern part of the State an independent republic with Nacogdoches as its capital. A skirmish in which one man was killed and one wounded ended the uprising. The time for a change was soon to come.

The United States was making repeated offers to the Mexican government to buy Texas, but this only made the Mexicans more determined to retain it at any cost. The Mexicans, resenting all attempts of the United States to possess the land, turned their attention to the Texans. Decrees were drawn up prohibiting slavery in Mexico and forbidding further colonization. These decrees were specially aimed at Texas and roused bitterness and indignation. The march of events was hastened by the closing of all Texas ports except Anahuac, and by the presence of military forces. An uprising occurred in June, 1832, which led to the removal of certain obnoxious officials. This was followed by the calling of a convention which elected Stephen F. Austin President. Petitions were drawn up asking the Mexican government for free trade for three years, begging for a grant of land from the State to promote education, and asking for a separate government. Austin was sent with the petition to Mexico, but could not gain a hearing and was made a prisoner. During 1833 and 1834 the Mexican government acceded to certain reforms; but in 1835 the spirit of revolt reappeared among the colonists. Then the Mexican government made another attempt to collect duties at the Texas ports. An armed schooner was sent to Anahuac, but after it committed various outrages, a Texas vessel captured it and the struggle against Mexico was precipitated. The first victory was that of Gonzales, Oct. 2, 1835, when the Texans put the Mexicans to flight. On October 28 Col. James Bowie and Capt. J. W. Fannin defeated the Mexicans near Mission Concepción, a few miles below San Antonio; on December 11 that city was taken. A provisional government was formed, Henry Smith was elected Governor, and Sam Houston major general of the armies of Texas; Branch T. Archer, William H. Wharton, and Stephen F. Austin were appointed commissioners to the United States. Many Americans, principally from Mississippi, hurried to the assistance of the Texans. Texan dissension, however, nearly proved disastrous. In March, 1836, two parties, one under Johnson and the other under Grant, were captured by Mexicans, and the prisoners slaughtered; Fannin's command, which had been in possession of the Goliad fortress, surrendered and was shamelessly massacred. Nearly 500 Texans met death. In February–March occurred the heroic defense of the Alamo (q.v.). March 2 the Texans issued a declaration of independence, and as if to answer this, Santa Anna, the Mexican President, hurried his army in three columns eastward over the country. On April 21 the Texan army under Houston on the field of San Jacinto avenged the slaughter of Fannin's men and the Alamo. (See SAN JACINTO, BATTLE OF.) Santa Anna, a prisoner, was glad to sign a treaty in which he engaged to do what he could for the independence of Texas with boundaries not to extend beyond the Rio Grande.

Thus was launched the Republic of Texas. A constitution was ratified in September, 1836, and Houston was elected President. Houston was the capital city from 1837 to 1839, when Austin became the capital. The great and pressing need of the Republic was money. With little taxable property, the government ran deeply in debt. By 1841 the amount reached $7,500,000. To the financial difficulties of the Republic was added the aggravation of invasions from Mexico, which had never abandoned her claims on the country. Three times Mexican forces reached San Antonio, but always retreated without attempting to hold the place.

Meantime the independence of Texas had been recognized by the United States, France, Holland, Belgium, and Great Britain, and the presence of the representatives of these powers lent zest to the interest with which the subject of the annexation of Texas to the Union was invested. The question of annexation was bound up with that of slavery, and the whole Union was agitated. (See under UNITED STATES.) The matter finally became a national issue, and James K. Polk was elected President on a platform favoring annexation; but before he took office a joint resolution was passed by Congress making an offer of statehood to Texas. This was accepted by the Texans, and in December, 1845, the State was formally admitted into the Union. The Mexican War (q.v.), originating in a dispute over the boundaries of Texas, followed, and the first fighting took place near the Rio Grande, at Palo Alto (May 8, 1846).

As a State of the Union Texas grew rapidly. Politics played small part until the wave of secession reached its borders. Texas, a slaveholding State, thereupon seceded from the Union (Feb. 1, 1861). Sam Houston was Governor at the time, and threw all his weight in opposition to secession, but there was no staying the resolve of the people, many of whom went soon to join the armies of the Confederacy. The State was fortunate in that it was not the scene of much active fighting. Galveston was captured and held by the Federal forces for three months in the fall and winter of 1862; but two attempts of the Union forces to enter the State from Louisiana were disastrously defeated. The last battle of the war was fought on the lower Rio Grande, near Palo Alto, a month after Appomattox.

Following out his plan of reconstruction, June 17, 1865, President Johnson appointed as provisional Governor A. J. Hamilton, a man conspicuous in antebellum Texas politics. A convention was called which adopted the constitution in force in the State prior to secession, with amendments recognizing the abolition of slavery, renouncing the right of secession, conferring civil rights on freedmen, repudiating the State debt incurred during the war, and assuming the tax which had been laid by the United States government on the State during the period of secession. The people ratified this constitution, and under it J. W. Throckmorton was elected Governor. The Reconstruction Acts of 1867 placed the State under the military authority, with General Sheridan in command. The carpetbaggers followed and the new reconstruction occupied the next three years. A constitution was submitted to the people in November, 1869, when Congressmen and State officers were elected, and on March 30, 1870, Texas was readmitted to the Union. At the election in November, 1872, the Democrats secured control of the State; and in December, 1873, a Democratic victory made Richard Coke Governor. By this time the State had become involved in debt to the extent of several millions of dollars on the score of reconstruction. The memory of reconstruction and the race problem have served to keep the State consistently Democratic.

The decade ending in 1915 was taken up largely with the elimination of the influence of large corporations and with the prohibition question. The Standard Oil Company and its subsidiaries were finally driven from the State. Several attempts to adopt constitutional amendments providing for State-wide prohibition failed, but legislation putting the sale of liquor under strict supervision was enacted. In the presidential election of 1908, Bryan received 216,737 votes, and Taft 64,602. Measures prohibiting betting at races and a bank guaranty bill were adopted by the Legislature of 1909 in a second extraordinary session called by Governor Campbell. O. B. Colquitt was elected Governor in 1910. In the presidential election of 1912 Wilson received 221,425 votes, Taft 28,688, and Roosevelt 26,740. Governor Colquitt was reëlected. James E. Ferguson was elected Governor in 1914, and at this election a constitutional amendment providing for the initiative and referendum was defeated. See articles UNITED STATES and MEXICO for conditions brought about in Texas by the revolutionary conditions in Mexico. See GREAT AMERICAN DESERT.

GOVERNORS OF COAHUILA AND TEXAS

José María Viesca, First Constitutional Governor	1827–30
Rafael Eca y Musquis	1830–31
José María de Letona	1831–32
Rafael Eca y Musquis	1832–33
Juan M. de Veramendi	1833–34
Francisco Vidauri y Villaseñor	1834–35
José María Cantú	1835
Marciel Borrego	1835
Augustin Viesca	1835

PROVISIONAL GOVERNOR

BEFORE THE DECLARATION OF INDEPENDENCE

Henry Smith	Nov. 12, 1835–March 18, 1836

PRESIDENTS UNDER THE REPUBLIC

David G. Burnet	March 18, 1836–October 22, 1836
Sam Houston	October 22, 1836–December, 1838
Mirabeau B. Lamar	December, 1838–December, 1840
David G. Burnet (acting)	December, 1840–December, 1841
Sam Houston	December, 1841–December, 1844
Anson Jones	December, 1844–February 19, 1846

GOVERNORS OF THE STATE

James P. Henderson	Democrat	1846–47
George T. Wood	"	1847–49
P. Hansborough Bell	"	1849–53
Elisha M. Pease	"	1853–57
Hardin G. Runnels	"	1857–59
Sam Houston	Independent and Unionist	1859–61
Edward Clark (acting)	Democrat	1861
Francis R. Lubbock	"	1861–63
Pendleton Murray	"	1863–65
Andrew J. Hamilton, Prov.	Unionist	1865–66
James W. Throckmorton	"	1866–67
Elisha M. Pease	Republican	1867–70
Edmund J. Davis	"	1870–74
Richard Coke	Democrat	1874–77
Richard B. Hubbard	"	1877–79
Oran M. Roberts	"	1879–83
John Ireland	"	1883–87
Lawrence S. Ross	"	1887–91
James S. Hogg	"	1891–95
Charles A. Culberson	"	1895–99
Joseph D. Sayers	"	1899–1903
S. W. Lanham	"	1903–07
Thomas M. Campbell	"	1907–11
Oscar B. Colquitt	"	1911–15
James E. Ferguson	"	1915–

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TEXAS, University of. A coeducational State institution at Austin, Tex., with a medical department at Galveston, founded upon a grant of 1,000,000 acres of land by the Legislature in 1876. In 1883 an additional million acres was set apart and the university was opened. The medical building at Galveston was completed in 1890, when the department was opened and the John Sealey Hospital, presented the previous year, was occupied. The medical buildings were in great part rebuilt after the disastrous Galveston flood of 1900. Besides the medical department, the university embraces the departments of literature, sciences, and arts, offering the degrees of B.A., M.A., and Ph.D.; the department of engineering, conferring the degrees of bachelor of science in architecture, in civil engineering, in electrical engineering, and in mechanical engineering, and also the degrees of C.E., E.E., M.E., and master of science in architecture; the department of law, conferring the degrees of LL.B. and LL.M.; and the department of education, divided into schools, as follows: the art of teaching, educational administration, the history of education, and the philosophy of education. The department of extension was organized in 1909 and the graduate department in 1910. Two summer schools are conducted at Austin during June and July. In 1914–15 the student attendance was 3445. The library had 115,000 volumes. For 1915–16 the endowment was $2,000,000 and the income $940,000. The acting president in 1916 was William James Bante.

TEXAS CHRISTIAN UNIVERSITY. An institution for higher education, founded at Fort Worth, Tex., in 1873, under the auspices of the Disciples of Christ. The total attendance in all departments in the autumn of 1915 was 697 and the faculty numbered 34. The plant of the university includes five buildings, and the total value of the equipment was about $500,000. The library contains about 5000 volumes. The president in 1916 was F. D. Kershner, M.A., LL.D.

TEXAS FEVER (also known as Bovine Piroplasmosis, or Babesiasis, Splenetic Fever, Tick Fever, Southern Cattle Fever, Hemoglobinuria, Redwater, Dry Murrain, Blackwater, Spanish Fever, etc.). A febrile infectious disease of cattle, usually observed in ezootic extension in the course of which hemoglobin appears in the urine as a result of the breaking down of red blood corpuscles. It is caused by (*Piroplasma*) *Babesia bigeminum* in the red blood corpuscles. This protozoan is transmitted to uninfected cattle by the progeny of ticks, particularly of the genus *Margaropus* or *Boöphilus,* that have developed on infected animals. The disease is characterized by fever, greatly enlarged spleen, destruction of the red blood corpuscles, escape of the coloring matter of the blood through the kidneys, giving the urine a deep-red color, yellowness of the mucous membranes and fat, rapid loss of strength, and fatal results in a large proportion of cases.

Medicinal treatment has but little value, although in chronic cases and those occurring late in the fall beneficial results have followed the administration of Epsom salts and quinine, and stimulating tonics. Recent work indicates that the dye known as trypanblue has a valuable curative effect when introduced intravenously. When the disease has broken out, all animals should at once be removed to a pasture known to be free from ticks in order that noninfected animals may be kept free. All ticks should be removed from sick animals in order to prevent the abstraction of blood and thereby retard the final recovery. Good nursing and a nutritious laxative diet with plenty of clean drinking water are essential.

In order to protect animals shipped into infected territory, they are immunized at from 6 to 15 months of age by introducing the microparasite from immune animals into their systems. Animals immunized in this way have a mild form of the disease which usually appears in from 3 to 19 days after the first inoculation and runs a course of from 6 to 8 days, followed in 30 days after the injection by a second attack of a milder character than the first.

Work of eradicating the cattle tick, which transmits the disease, from the southern United States—where the disease occurs—has been conducted by the United States Department of Agriculture in coöperation with the infected States. Up to July 1, 1915, a total area of 275,782 square miles had been released as free from ticks, or more than one-third of the original area in the United States infested with the cattle tick. Tick eradication may be accomplished through dipping infested animals in vats which contain a solution sufficiently strong to kill the ticks without injury to the host. A system of pasture rotation whereby the ticks meet death from starvation before finding a host is also made use of.

Consult: James Law, *Text Book of Veterinary Medicine,* vol. v (Ithaca, N. Y., 1911); Hutyra and Marek, *Special Pathology and Therapeutics of the Diseases of Domestic Animals,* vol. i (Amer. ed. from 3d Ger. ed., by Mohler and Eichhorn, Chicago, 1912); United States Bureau of Animal Industry, *Special Report on Diseases of Cattle* (rev. ed., Washington, 1912).

TEXAS RANGERS. See Rangers, Mounted.

TEXAS STEER. See Cattle.

TEXAS UMBRELLA TREE. See China Tree.

TEXCOCO. See Tezcuco.

TEX'EL. The southernmost and largest of the West Frisian Islands, belonging to the Dutch Province of North Holland, and situated at the entrance to the Zuider Zee (Map: Netherlands, C 1). It is separated from the mainland on the south by the Marsdiep about 5 miles wide. Area, 73 square miles. It consists largely of good meadow land lined on the north and west by sand dunes, and protected from the sea on the other sides by dikes. The principal industry is sheep raising, there being some 34,000 sheep on the island, and wool and cheese of fine quality are exported. Pop., 1899, 5954; 1909. 6407.

TEXIER, tĕs'yâ', Charles Félix Marie (1802–71). A French archæologist, born in Versailles. He explored the antiquities of Asia Minor and taught at the Collège de France. His works include: *Description de l'Asie Mineure*, published in Paris and London (1839–48); *Description de l'Arménie, la Perse et de la Mésopotamie* (1842–45); *Asie Mineure* (1862).

TEXTILE DESIGNING (Lat. *textilis*, relating to weaving, from *textus*, fabric, composition, text, from *texere*, to weave; connected with Gk. *τέκτων*, *tektōn*, carpenter, *τέχνη*, *technē*, art, Skt. *takṣ*, to cut, form). That branch of textile manufacturing which is devoted to the construction of fabrics, their weaves and patterns or designs for the same. Unlike the designing for printed patterns, whether for textiles, wall-paper, or other purposes, which are termed applied designs—and for which the designer is only called upon to use his skill in drawing and color combination—the designing of fabrics in which the pattern is to be woven of threads colored before weaving, or in which the pattern is produced by the weaves, necessitates in addition to knowledge of combining colors and drawing a thorough knowledge of each of the various departments or processes of textile manufacturing (q.v.). The designer must be able to construct fabrics of a required weight, texture, and finish, or for a specific purpose, telling the manufacturer what size of warp and filling to use, how many threads of each to the inch, and what weave will give the required results.

The construction of various weaves is one of the most important features of textile designing, and an account of weave construction will be found in the article Weaving. A complete design for a woven fabric must contain at least the following specifications: Number of warp threads to an inch; number of inches wide on loom; number of picks, or filling threads, to an inch; size of warp and filling yarns and materials for same; the weave and the arrangement of the warp thread on the loom harness, with full particulars relative to manipulation of materials in the process of manufacturing; the estimated weight of the fabric as woven; the finishing processes it is to be submitted to, together with its finished width, weight, and texture, that is, the count in warp and filling threads to the inch. When the pattern is to be worked out in colored threads the arrangement of these must be given; and when the pattern is drawn and possibly colored, then the weave is constructed in such a way as to produce with the woven threads the effect of the drawing as nearly as possible. See Loom; Weaving; Textile Manufacturing.

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TEXTILE MANUFACTURING. The industrial group of manufactures embracing the production from the various raw materials of fabrics of cotton, wool, silk, flax, hemp, and jute; hosiery and knit goods; felt goods and wool hats; cordage and twine; laces, braids, and embroideries.

Textile Manufacturing in the United States.—Statistics. The importance of the textile industry in the United States is seen from the table (I, page 148) of statistics derived from Census Reports of 1910, which shows 75.4 per cent increase in the capital invested, during the first decade of the present century, over the decade immediately preceding; an increase of 59.7 per cent in the annual amount of wages paid for the same period; and 79.2 per cent increase in the annual value of the manufactured product. An exact knowledge of the general growth of the industry is difficult to arrive at, in consequence of varying conditions, and probably the best idea of its growth is the increase of wage earners as shown by decades in Table II. In spite of the fact that the improved machinery makes the productive power of one man's labor many times greater than it was a half century ago, the increase in wage earners each decade has exceeded the general growth of the population except between 1850 and 1860.

The importance of the industry is also shown by Table III, which shows not only the "combined textiles," but individual industries classed to show conditions by decades, 1860–1910.

The increase in the amount of the various raw materials used by decades from 1840 to 1910 is shown by Table IV, which also furnishes a measure of the relative growth of the several industries. It is well to notice in this connection, however, that because of the unsettled conditions in the Southern States from 1860 to 1870 there was a decrease in the amount of cotton used, while for each decade there is a large and steady increase in the amount of wool used. During the twenty-year period 1860 to 1880 the amount of cotton used did not double itself, while the use of wool increased over 300 per cent; but the use of cotton shows a wonderful increase from 1880 to 1910, due largely to the development of the cotton-manufacturing industry in the Southern States, which bids fair to monopolize the production of the medium and coarser grades of cotton fabrics.

The world's production of commercial cotton in 1914, i.e., the amount available for mill purposes, was approximately 24,764,000 bales of 500 pounds net weight. The contributions of the leading countries to the world's mill supply of cotton for 1913 and 1914, according to the United States Bureau of the Census, are shown in Table V, page 150.

Reduced to percentages, the contributions of the leading countries to the mill supply in 1914 were: United States, 62.3; India, 15.4; China, 7.1; Egypt, 5.6; Russia, 4.6.

The world's consumption of cotton for 1914–15 is estimated by the Bureau of the Census as 19,761,000 bales of 500 pounds net weight, of which the United States took 5,429,000, the United Kingdom 3,890,000, and continental Europe 6,250,000 bales. In the United States the cotton-growing States took 2,938,000 bales and the other States 2,491,000 bales. There were 141,500,000 active and idle spindles in the world in 1915, of which there were in the United States, during November, 31,497,435 active spindles. There were located in the cotton-growing States at that time 12,801,204 active spindles and in the other States 18,696,231.

It is difficult to obtain exact information about the relative importance of the United States in the manufacture of textiles, as the statistics are collected in no other country with the thoroughness which characterizes the American census. It is universally known that Great Britain is far in the lead in cotton manufacturing; but because of the fact that the greater part of the spindles in the United States run on coarse or medium-sized yarns, and those of England on much finer yarns, the United States actually spins more pounds of the raw material. Nevertheless cotton manufacturing is an important industry in other countries than Great Britain and the United States. The cotton consumption for the chief countries of the world and the number of spindles in operation in 1915 are given in Table VI.

TABLE I

COMPARATIVE SUMMARY OF TEXTILE INDUSTRIES, 1889 TO 1909, WITH PER CENT OF INCREASE

	COMBINED TEXTILES							
	Number or amount				Per cent of increase			
	1909	1904	1899	1889	1899–1909	1904–1909	1899–1904	1889–1899
Number of establishments	5,352	4,737	4,521	4,420	18.4	13.0	4.8	2.3
Persons engaged in the industry	915,858	770,512	†	†	......	18.9	.....	.....
Proprietors and firm members	3,522	3,611	†	†	.....	* −2.5	.....	.....
Salaried employees	31,208	24,372	17,024	†	83.3	28.0	43.2	.....
Wage earners (average number)	881,128	742,529	664,429	520,196	32.6	18.7	11.8	‡
Primary horse power	2,099,050	1,623,403	1,310,834	831,730	60.1	29.3	23.8	57.6
Capital	$1,841,242,131	$1,351,451,715	$1,049,636,201	$772,673,605	75.4	36.2	28.8	35.8
Expenses	1,488,817,311	1,123,356,860	824,336,963	681,538,981	80.6	32.5	36.3	21.0
Services	384,522,370	283,376,354	233,602,184	182,165,458	64.6	35.7	21.3	28.2
Salaries	49,123,634	32,862,121	23,532,793	†	108.7	49.5	39.6	.....
Wages	335,398,736	250,514,233	210,069,411	†	59.7	33.9	19.3	.....
Materials	992,635,299	753,174,981	527,209,771	454,272,489	88.3	81.8	42.9	16.1
Miscellaneous	111,659,642	86,805,525	63,525,008	45,101,034	75.8	28.6	36.6	40.8
Value of products	1,684,636,499	1,225,686,444	940,052,688	768,357,254	79.2	37.4	30.4	22.3
Value added by manufacture (value of products less cost of materials)	692,001,200	472,511,463	412,842,917	314,084,765	67.6	46.5	14.5	31.4

* A minus sign (−) denotes decrease. Where percentages are omitted, comparative figures are not available.
† Comparable figures not available.
‡ Figures not strictly comparable.

TABLE II

INCREASE IN AVERAGE NUMBER OF WAGE EARNERS AND IN VALUE OF PRODUCTS, PER ESTABLISHMENT, 1889–1909

YEAR	INCREASE IN	
	Average number of wage earners	Average value of products
1889	118	$173,836
1899	147	207,930
1904	157	258,747
1909	165	314,768

The increase in combined value of products was from $572,253,099 in 1879 to $1,684,636,499 in 1909, and in the number of wage earners for the same period, from 405,744 to 881,128.

The relative standing of the countries in wool manufacturing is more difficult to arrive at accurately since wool is grown as well as manufactured in many lands, so that it is impossible to secure exact figures as to consumption. It might be said that Great Britain, France, Germany, and Austria-Hungary produce fully five-sixths of all the woolen goods made in Europe, Great Britain being in the lead. See WOOL MANUFACTURES; also SHEEP.

Great Britain has perhaps the most important woolen industry, since the quality of wool used is better and a greater amount of labor is employed. More fine goods are produced in France than in the United States, but the relative rank of that country and Germany cannot be fixed. The carpet industry, which absorbs large quantities of wool, is probably more important in the United States, but large amounts of coarse goods are produced in both countries.

Among the several countries engaged in silk manufacturing the United States now stands in first place, having surpassed France in the value of its product in the early years of the twentieth century. This is the more remarkable when we consider that the industry in the United States has been developed since 1870, and note, as in Tables III and IV, the rapid growth. It must be said, however, that statistics or estimates for Japan and China are not available, and it may be that one or both of these Eastern nations leads the United States. (See SILK.) The importance of the silk industry and the

TABLE III. COMPARATIVE SUMMARY, BY INDUSTRIES, 1850 TO 1910

INDUSTRY	Year	Number of establishments†	Capital	SALARIED OFFICIALS, CLERKS, ETC.		WAGE EARNERS		Miscellaneous expenses	Cost of materials used	Value of products
				Number	Salaries	Average number	Total wages			
Cotton manufacture—Cotton goods and cotton small wares	1910	1,324	$822,237,529	8,514	$14,411,758	378,880	$132,859,145	$35,941,315	$371,009,470	$628,391,813
Wool manufacture	1910	1,124	506,205,584	6,987	12,306,199	202,029	87,962,669	27,599,714	322,441,043	507,166,710
Silk manufacture	1910	852	152,158,002	5,537	7,527,279	99,037	38,570,085	23,311,439	107,766,916	196,911,667
Hosiery and knit goods	1910	1,374	163,641,171	5,721	7,691,457	129,275	44,740,223	13,056,850	110,241,053	200,143,527
Cordage, twine, jute, and linen goods	1910	164	76,020,366	1,314	1,862,546	25,820	9,132,999	4,166,177	40,914,810	61,019,986
Dyeing and finishing textiles	1910	426	114,092,654	2,939	5,034,710	44,046	21,226,924	7,124,918	35,261,301	83,556,432
Combined textiles	1910	5,264	$1,834,355,306	31,012	$48,833,949	879,087	$334,492,045	$111,200,413	$987,634,593	$1,677,190,135
Cotton manufacture—Cotton goods	1900	973	$460,842,772	4,713	$7,123,574	297,929	$85,126,310	$21,650,144	$173,441,390	$332,806,156
Cotton small wares	1900	82	6,397,385	189	226,625	4,932	1,563,442	462,534	3,110,137	6,394,164
Wool manufacture	1900	1,414	310,179,749	4,495	6,455,495	159,108	57,933,817	17,329,932	181,159,127	296,990,484
Silk manufacture	1900	483	81,082,201	2,657	3,134,352	65,416	20,982,194	10,264,208	62,406,665	107,256,258
Hosiery and knit goods	1900	921	81,860,604	2,809	3,124,798	83,387	24,358,627	6,599,865	51,071,859	95,482,566
Flax, hemp, and jute	1900	141	41,991,762	641	957,190	20,903	6,331,741	2,678,286	32,197,885	47,601,607
Dyeing and finishing textiles	1900	298	60,643,104	1,318	2,267,128	29,776	12,726,316	4,137,947	17,958,137	44,963,331
Combined textiles	1900	4,312	$1,042,997,577	16,822	$23,289,162	661,451	$209,022,447	$63,122,916	$521,345,200	$931,494,566
Cotton manufacture	1890	905	$354,020,843	2,709	$3,464,734	218,876	$66,024,538	$16,716,524	$154,912,979	$267,981,724
Wool manufacture	1890	1,693	245,886,743	3,652	4,057,695	154,271	54,339,775	15,622,263	167,233,987	270,527,511
Silk manufacture	1890	472	51,007,537	1,531	1,917,877	49,382	17,762,441	4,259,623	51,004,425	87,298,454
Hosiery and knit goods	1890	796	50,607,738	1,621	1,685,153	59,588	16,578,119	3,627,245	35,861,585	67,241,013
Flax, hemp, and jute	1890	162	27,731,649	458	609,170	15,519	4,872,389	1,431,932	26,148,344	37,313,021
Dyeing and finishing textiles	1890	248	38,450,800	666	805,291	19,601	8,911,720	3,131,081	12,385,220	28,900,560
Combined textiles	1890	4,276	$767,705,310	*10,637	*$12,539,920	517,237	$168,488,982	$44,788,668	$447,546,540	$759,262,238
Cotton manufacture	1880	756	$208,280,346	......	....	‡174,659	$42,040,510	....	$102,206,347	$192,090,110
Wool manufacture	1880	2,330	143,512,278	......	....	132,672	40,687,612	....	149,160,600	238,085,686
Silk manufacture	1880	382	19,125,300	......	....	31,337	9,146,705	....	22,467,701	41,033,045
Hosiery and knit goods	1880	359	15,579,591	......	....	28,885	6,701,475	....	15,210,951	29,167,227
Dyeing and finishing textiles	1880	191	26,223,981	......	....	16,698	6,474,364	....	13,664,295	32,297,420
Combined textiles	1880	4,018	$412,721,496	......	....	‡384,251	$105,050,666	....	$302,709,894	$532,673,488
Cotton manufacture	1870	956	$140,706,291	......	....	135,369	$39,044,132	....	$111,736,936	$177,489,739
Wool manufacture	1870	3,208	121,451,059	......	....	105,071	35,928,150	....	124,318,792	199,257,262
Silk manufacture	1870	86	6,231,130	......	....	6,649	1,942,286	....	7,817,559	12,210,662
Hosiery and knit goods	1870	248	10,931,260	......	....	14,788	4,429,085	....	9,835,823	18,411,564
Dyeing and finishing textiles	1870	292	18,374,503	......	....	13,066	5,221,538	....	99,539,992	§113,017,537
Combined textiles	1870	4,790	$297,694,243	......	....	274,943	$86,565,191	....	$353,249,102	$520,386,764
Cotton manufacture	1850	1,094	$74,500,931	......	....	92,286	....	....	$34,835,056	$61,869,184
Wool manufacture	1850	1,675	31,971,631	......	....	45,438	....	....	28,831,583	48,608,779
Silk manufacture	1850	67	678,300	......	....	1,743	....	....	1,093,860	1,809,476
Hosiery and knit goods	1850	85	544,735	......	....	2,325	....	....	415,113	1,028,102
Dyeing and finishing textiles	1850	104	4,818,350	......	....	5,105	....	....	11,540,347	15,454,430
Combined textiles	1850	3,025	$112,513,947	......	....	146,877	....	....	$76,715,959	$128,769,971

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* **Includes proprietors and firm members with their salaries; number only reported in 1900 and 1905 but not included in this table.**

† In addition to these data there were in the census of 1880 returns for 249 "special mills," engaged in working raw cotton, waste, or cotton yarn into hosiery, webbing, tapes, and fancy fabrics, and mixed goods or other fabrics, which are not sold as specific manufactures of wool or cotton. These 249 establishments reported $11,224,448 capital, 12,928 employees, $3,573,909 wages, $2,338,385 cost of cotton consumed, $18,860,273 value of products, and should be considered in making comparisons. In 1890 this class of mills is reported under a number of different heads, although some of them may be included in the totals for textile industries presented in the figures for 1890.

‡ Includes 2,115 officers and clerks, whose salaries were not reported.

§ At the census of 1870 the value of the fabric itself was reported, whereas in all subsequent censuses merely the value added to such fabric by the process of dyeing and finishing is given.

range of products in American manufactures are shown in Table VII, from the Thirteenth United States Census (1910).

Influences Controlling Development. The influences controlling the establishment of the textile industry in a given country are primarily the supply of the raw material and the adaptability of the people to manufacturing life. Among the earliest forms of machinery are the hand loom and spinning wheel; and as sheep usually are raised in any country where clothing must be warm, it is not surprising to find in the world's earliest history records of the production of fabrics of wool; these came to be known as homespun, because made from yarn spun at home and woven by hand in the household. That the woolen industry should spring up in primitive communities, and among people not easily able to purchase clothing material, is only natural; as the comforts of life became more accessible and labor became diversified and specialized, owing to the increase in population, the tendency was to produce fabrics for sale and in such quantities as required the use of more improved machinery; and in order to reduce the cost further large numbers of machines were collected and there resulted the mill or factory.

TABLE IV

CONSUMPTION OF TEXTILE FIBRES, 1840 TO 1910

YEAR	Cotton, pounds *	Wool, pounds †	Silk, pounds
1910	2,335,344,906	559,850,995	17,472,204
1900	1,910,509,193	412,323,430	9,760,770
1890	1,193,374,641	372,797,413	6,376,881
1880	798,344,838	296,192,229	2,690,482
1870	430,781,937	219,970,174	684,488
1860	443,845,378	98,379,785	462,965
1850	288,558,000	70,862,829	....
1840	126,000,000	....	....

* Includes cotton consumed in establishments classed as cotton goods, cotton small wares; woolen goods, worsted goods, carpet and rugs, other than rag; felt goods; wool hats; and hosiery and knit goods.

† Includes wool consumed in establishments classed as woolen goods; worsted goods, carpets and rugs, other than rag; felt goods; wool hats; and hosiery and knit goods.

TABLE V

WORLD'S SUPPLY OF COTTON

COUNTRY	1914 500-pound bales	1913 500-pound bales
United States	15,438,000	13,545,000
India	3,826,000	3,692,000
Egypt	1,384,000	1,496,000
China	1,750,000	1,200,000
Russia	1,126,000	1,030,000
Brazil	440,000	420,000
Mexico	125,000	150,000
Peru	103,000	110,000
Persia	127,000	140,000
Turkey	120,000	130,000
All other countries	325,000	285,000
Total	24,764,000	22,198,000

As cotton is a subtropical plant and the lint is easily separable from the seed by hand, and as the fibre can be spun and woven in as simple a way as wool was manufactured in primitive communities, it would seem that the cotton industry should have developed near the source of the raw material; but the sections of the countries suited to raising cotton were largely inhabited by people with agricultural instincts, hence the industry developed in thickly settled communities remote from the cotton field. One important feature in the early days of the cotton industry in factories was the fact that cotton fabrics must necessarily be light in weight and of comparatively fine yarns—consequently the proportion of labor cost to the cost of production was much greater than in the production of fabrics of wool, and the tendency was to concentrate in their production; this also stimulated invention of labor-saving machinery. The result is that virtually the whole manufacture is in the hands of invested capital, and the tendency is for it to expand in communities where it is already established, and, unless favored by special advantages, to languish or to be neglected in sections where it is newly introduced.

TABLE VI

ESTIMATED COTTON CONSUMPTION, 1914–15

COUNTRY	Cotton spindles 1915	Cotton consumed, bales of 500 lbs. gross 1915
Great Britain	56,500,000	3,945,000
Germany	11,720,000	2,060,000
France	7,400,000	*1,200,000
Russia	9,100,000	*1,800,000
Austria	4,950,000	†850,000
Italy	4,600,000	720,000
Spain	3,100,000	400,000
Switzerland	1,500,000	125,000
Belgium	1,200,000	*250,000
Japan	2,652,000	1,400,000
China	1,100,000	2,500,000
India	6,779,000	2,175,000
Brazil	1,500,000	320,000
United States	32,300,000	6,122,000
Canada	920,000	156,000
World total	148,226,000	24,581,200

* 1914. † Including Hungary.

TABLE VII

NUMBER AND CHARACTER OF THE LOOMS IN THE UNITED STATES

KIND OF LOOMS	Total	Carpets and rugs	Cotton goods	Silk goods	Woolen goods
Power:					
1910	793,004	11,736	632,963	75,406	72,899
1905	696,750	11,002	559,781	59,775	38,104
1900	573,194	9,841	455,752	44,257	36,714
Hand:					
1910	248	207	*	*	41
1905	1,039	690	*	283	66
1900	1,311	1,055	*	173	83

* Not reported.

In the thickly settled centres of India the industry had its greatest growth in a semitropical country, fully adapted to the production of the fibre; yet the inhabitants make better laborers in the factories than they do cultivators of the crop. Those who follow agricultural pursuits are content to do so in a small way, simply raising the product for individual use rather than in commercial farming.

In China, Japan, the East Indies, and Mexico there has been of recent years a considerable introduction or development of the industry, due almost entirely to the adaptability of the people to a manufacturing life. Yet it is doubtful if the movement would have been as successful in some of these cases if there had not been encouragement in the way of government measures.

The most wonderful growth of the cotton-manufacturing industry has been in the southern United States. The availability of the raw material, made possible largely by the agricultural labor of the negro, and the presence of a class of the white population who, after the war, found themselves without homes or occupation and who it was found were teachable and tractable, and would make good factory hands, and were to be had in abundance, were chief factors in this development; there were available water power and land which could be secured cheaper than elsewhere, and at first municipal aid in the way of exemption from taxation for a term of years. The growth of the industry in the Southern States has been remarkably steady since 1880, and ample proof of its success is evidenced by the fact that more and larger mills have been built and that older ones have been enlarged and developed. The difficulty of finding sufficient suitable labor has proved some hindrance to recent cotton manufacturing in the South.

TABLE VIII

PRODUCTS OF SILK INDUSTRIES

PRODUCT	Total production 1909	Production in the silk-manufacturing industry	Production in other industries *
Broad silks, plain and fancies:			
All silk:			
Yards	82,307,526	81,934,158	373,368
Value	$53,418,522	$53,282,704	$136,818
Silk mixed:			
Yards	28,645,106	24,742,556	3,902,550
Value	$15,136,632	$14,207,861	$928,771
Plushes:			
Yards	2,770,311	2,759,411	10,900
Value	$2,112,968	$2,104,768	$8,200
Ribbons	$32,873,469	$32,744,873	$128,596
Braids and bindings	4,495,964	4,483,248	12,716
Trimmings	3,853,448	3,850,448	3,000
Hosiery	†3,600,416	‡	3,600,416
Shirts and drawers, silk and silk mixed	†709,074	‡	709,074
Combination suits, silk and silk mixed	†239,218	‡	239,218
All other products	86,237,765	86,237,765	....
Value of all products	202,678,476	196,911,667	5,766,809

* Includes products made by establishments in the following industries: clothing, men's, including shirts; corsets; cotton goods and cotton small wares; fancy articles, not elsewhere specified; furnishing goods, men's; hosiery and knit goods.

† Exclusive of hosiery and knit goods made in the silk-manufacturing industry.

‡ Included with "all other products."

The sources which first gave the so-called civilized nations their fine and beautiful fabrics of silk were China and Japan; there the silkworm flourished, labor was plentiful and cheap, and the nations æsthetic; they produced beautiful but costly fabrics which were considered luxuries as far back as the nations have a history, yet these nations now put forth less in value than many others, though they still produce fabrics which the more highly civilized nations can hardly equal. The growth of the silk industry should be greatest in those countries which can produce the raw material, but this is not always the case. The introduction of the silkworm into central and western Europe caused a remarkable expansion of the manufacture of silks in Switzerland, Italy, Austria, and France. The Germans, producing practically no raw silk, however, have made a great success of the industry, as has the United States in recent years. England, however, with a wonderful capacity for manufacturing, having attempted the silk industry, relying on imported silk, though fairly successful for a time, has seen it decline for the last half century, while the cotton industry during the same period has had an extraordinary development. Mr. Edward Stanwood, of Boston, a textile statistician, in speaking of the development of the industry of the United States, has said that cotton and silk mills in the greatest proportion over "the country, are in the five adjoining States of Pennsylvania, New Jersey, New York, Connecticut, and Massachusetts, and of the spindles, more than $\frac{18}{20}$ of the whole are in the mills of those States." The most important reason for this localization is the presence of sufficient labor of requisite skill to manufacture the raw material and produce fine and costly fabrics—a labor which would be too costly to employ in the production of cotton goods except those of the very finest quality, but which may be employed in the silk industry with profit. Yet another factor has been an encouraging government policy, which has helped to establish the industry more firmly.

These are briefly the important features in connection with the development of the most important of the world's textile industries. Consult: E. A. Posselt, *Recent Improvements in Textile Machinery* (Philadelphia, 1905); A. F. Barker, *Textiles* (New York, 1910); *Lamb's Textile Industries of the United States* (5 vols., Boston, 1911); W. H. Dooley, *Textiles for Commercial, Industrial, and Domestic Art Schools* (ib., 1914); C. H. Lander, *Ventilation and Humidity in Textile Mills and Factories* (New York, 1914); *Davison's Textile Blue Book* (28th Office ed., ib., 1915). See COTTON; FACTORIES AND THE FACTORY SYSTEM; MANUFACTURES; SILK; WOOL AND WORSTED MANUFACTURES; ETC.

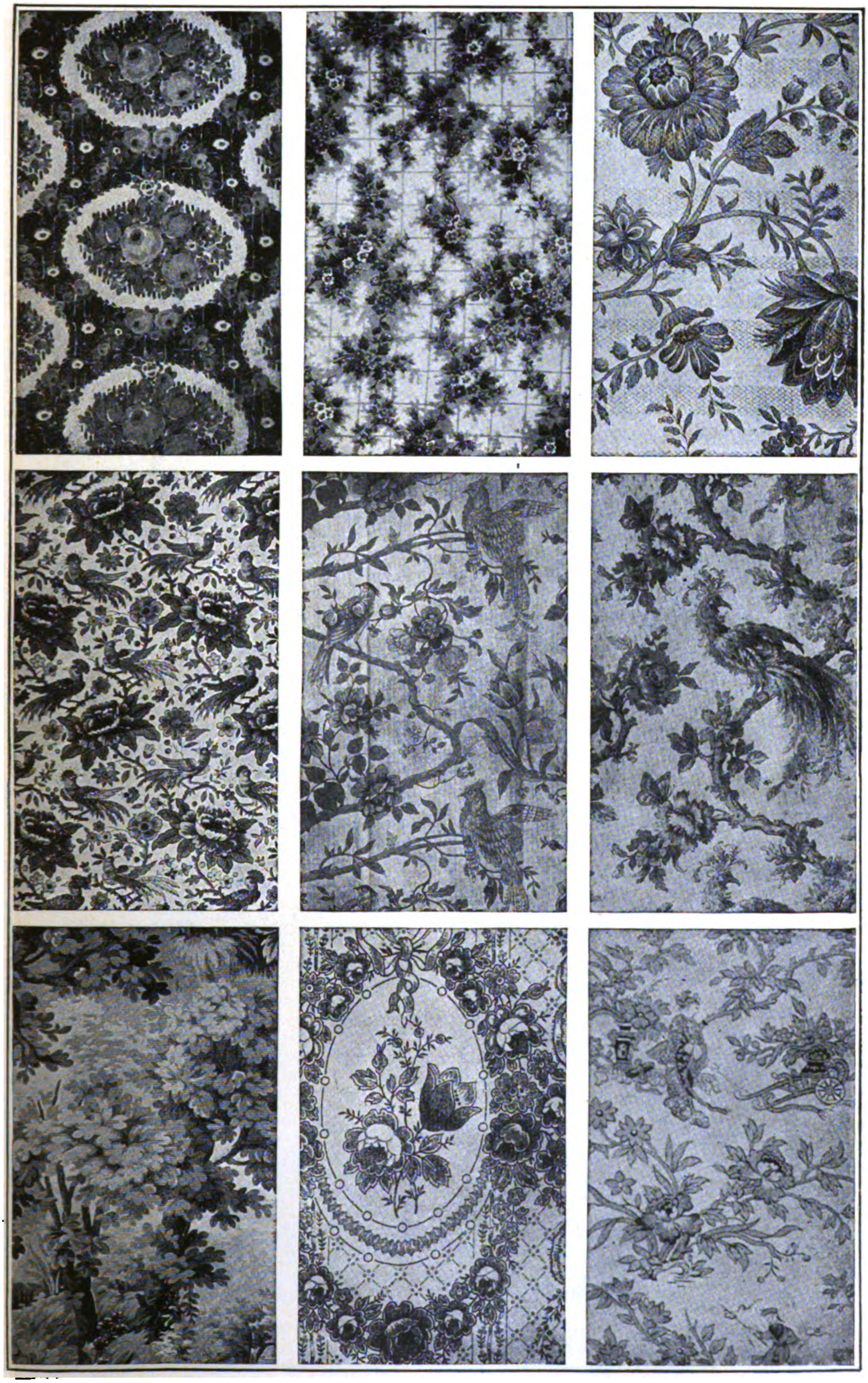
TEXTILE PRINTING. The printed cloths of the eighteenth century in Europe were made in imitation of the Indiennes that for two hundred years had been imported from India, which may be regarded as the home country of printed cottons much as China is the home country of brocaded silks, and Flanders the home country of fine woolens. But block printing of textiles in one form or another can be traced back among the Egyptians, Assyrians, and Chinese to remote ages, and it was closely associated with other similar processes that produce similar results, such as painting, stenciling, and dyeing. In printing fabrics the color is stamped on from an engraved block or roller. Pliny says that the Egyptians figured fabrics by applying several mordants with different powers of resistance, presumably by stamping or stenciling, in such a way that one dipping in the dye pot produced a pattern in several colors. There are still preserved in European museums many examples of block-printed textiles from early Christian (Coptic) Egypt. A fragment of printed cotton was found at Arles in the grave of St. Cæsarius, who was Bishop there in the middle of the sixth century A.D. During the twelfth, thirteenth, and fourteenth centuries, in Germany the place of the rich Saracenic, Byzantine, and Italian damasks and brocades was largely taken by inexpensive block-printed imitations. There survive examples of Rhenish thin-printed silks with simplified patterns in gold and silver; and coarse linens outlined in dark browns and blacks. In the seventeenth century the industry revived and Augsburg was famous for its printed linens, supplying Alsace and Switzerland with many trained workmen. In 1676 textile printing was introduced in England by a French refugee who opened an establishment on the Thames near Richmond. In the last half of the eighteenth century the art was brought to a high point of perfection in France, especially at Jouy, near Versailles, where Oberkampf produced printed linens that excelled in technique as well as in design, so that a leading place in the market to-day is held by modern reproductions of Jouy prints, some of these made from the original blocks. The most prolific designer for the works at Jouy, many of whose original drawings are still preserved at the Musée des Arts Décoratifs in Paris, was Jean Baptiste Huet. At this period the popularity of printed linens and wall papers became such that they crowded tapestries from the walls of even stately mansions, and brought to humbler homes decoration that had previously been lacking. At the end of the eighteenth century metal rollers took the place of wooden blocks for the production of simple repeat patterns inexpensively, and the modern machine period had begun. The invention of rollers is attributed in France to Oberkampf and in Great Britain to Bell. In the last quarter of the nineteenth century William Morris raised the standard of design greatly by his introduction of ingenious and richly colored flower and bird patterns, going back for his inspiration to Persian and Indian flat ornament, away from the modeled shapes and monotonous tiny repeats that had been in vogue in Europe since the Empire period. To-day block prints are again used for picture effects and large patterns, and the designs of the roller prints are growing constantly better. The block prints and the finer roller prints are on linen, the cheaper ones on cotton.

Block Printing. The blocks used are rectangular planks of wood about three inches thick, six inches wide, and nine inches long, built up out of two or more layers of pine with facing of sycamore, plane, or pear, and with a strong handle to lift them by. The design is transferred to the blocks by rubbing off a tracing in lampblack and oil of the outlines of the particular color, and then tinting the portions that are to be left in relief to distinguish them from those that are to be cut away. Fine details difficult to cut in wood, and that in printing from wood would wear down or break off, are inserted by coppering or building up with thin strips of brass bent to shape and driven edgewise into the wood. Where large surfaces of solid color occur the background is cut away and replaced by felt that gives a better impression than is given by a large surface of wood. Besides his blocks the printer needs a table and a color sieve. The top of the table is a slab of stone that is covered with a thick woolen blanket. The color sieve is a shallow box which floats in a swimming tub of starch paste, and which has a bottom of fine woolen stuff over which the color is distributed evenly with a brush. The cloth comes from a roll on the right of the table, and after being printed is carried to the ceiling on rollers, from which it hangs until dry and ready for its next color. When the first section of the cloth has reached its table the printer inks the block by applying it twice in different directions to the color sieve, and then presses it hard against the cloth, driving home the impression by striking the back of the block with a heavy wooden mallet. The impression with the second block on the second section of the cloth is made to join the first exactly by means of the guide pins at the corners of the blocks. These pin marks are one of the most obvious features that distinguish block from roller prints. The perrotine is a block-printing machine invented by Perrot of Rouen in 1834, and still occasionally used in France and Italy, which automatically prints three colors from long narrow blocks, infusing the second and third colors on the first while it is still wet.

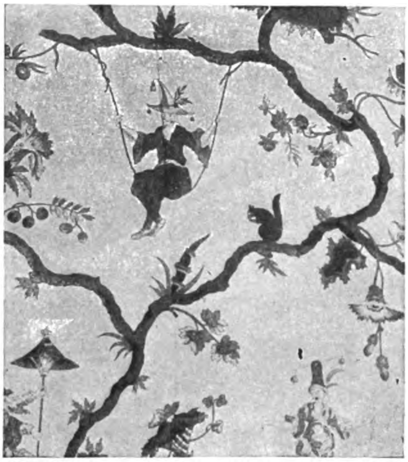
Roller Printing. While the design in block printing is cut in relief on wood the design in roller printing is engraved on copper rollers. The process was patented for a six-color machine by Bell in England in 1785. In this machine, that now carries sometimes as many as sixteen colors, the rollers of the different colors are mounted around the circumference of a huge drum, the surface of which, wrapped with several thicknesses of lapping, takes the place of the block printer's table. As the drum revolves, the cloth is pressed between the drum and the rollers, each of which leaves its color and pattern, so that the cloth that comes to the drum in the gray, leaves it completely printed with all the colors. Each roller is inked by a wooden roller revolving in a color box below it, and has the surplus color (i.e., the color on the surface of the roller, as distinguished from the color in the engraved incisions) removed by a knife called the doctor. The roller printing is rapid and inexpensive, one machine producing from 10,000 to 15,000 yards a day. The pattern on the copper rollers is produced by etching, or by indention from a mill. In the first process the pattern is photographed, magnified on a zinc plate, and colored by hand. Then the outlines of each color are engraved by hand, and transferred and reduced in the pantograph machine to a varnished copper roller which is then etched with nitric acid, the acid eating copper away only where the design has been pin-pricked with the pantograph needle. In the mill process the design is first engraved by hand on a soft steel roller, which is the die. The die is then hardened and rotated against a softened steel roller until the latter has the design in relief. This is the mill that when itself hardened and rotated against the copper roller produces this pattern on the latter in intaglio.

Stenciling. This process is nearer painting than printing, the colors being applied with a brush through sheets of thick paper or thin metal from which the pattern has been cut completely out with a sharp knife, the uncut portions covering the parts of the surface that are to be left uncolored. A peculiarity of stenciled patterns is the ties that have to be left to keep detached or nearly detached portions of the background connected with the rest of the stencil. These ties spoil the design when badly placed, but when skillfully used add distinctive charm. The Japanese are especially skillful in the use of stencils, often employing them in connection with painting and with block printing. As of blocks, so of stencils; there must be a separate set for each color. A special method of applying the color that produces results of unusual delicacy is spray printing with the air

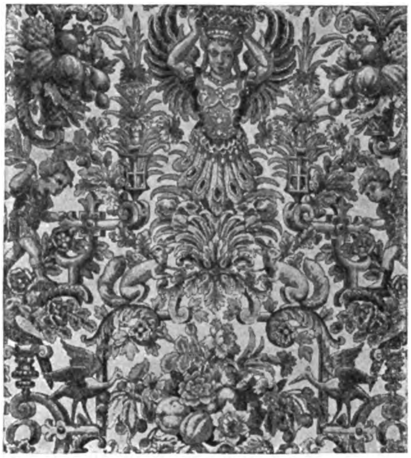
TEXTILE PRINTING



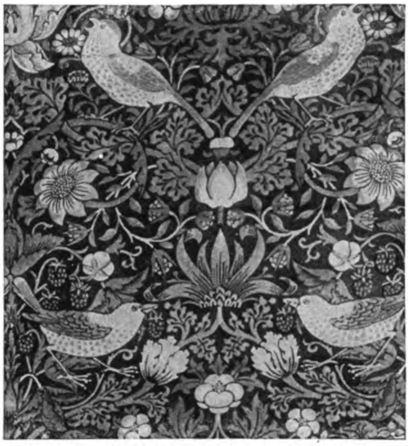
AMERICAN CRETONNES, TAFFETAS, AND REPS



A QUAINT AND CURIOUS CHINOISERIE



A RICH FRENCH RENAISSANCE PATTERN



THE STRAWBERRY THIEF
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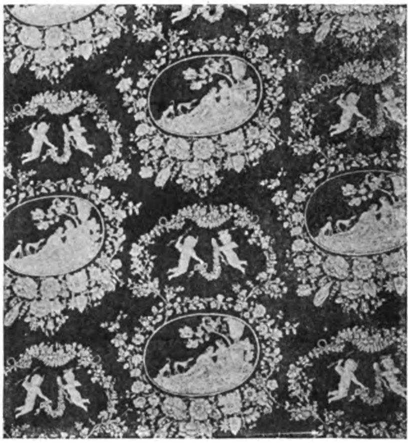
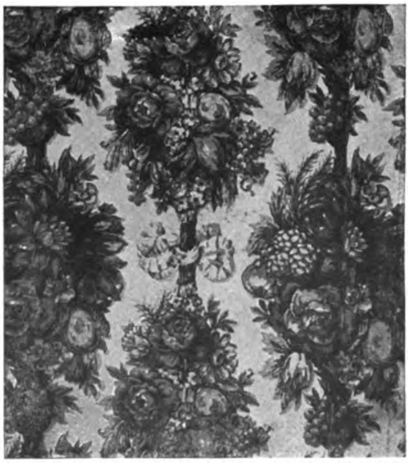
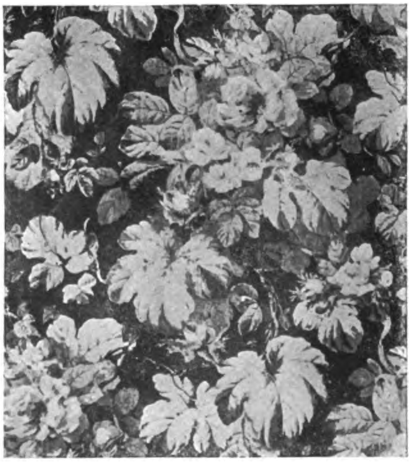


AN ANCIENT TOILE DE JOUY



FROM ONE OF GRINLING GIBBONS'
FAMOUS CARVINGS



ORIGINATED FOR KING GEORGE V

EUROPEAN HAND-BLOCKED DRAPERIES

brush, invented in Lyons and first practiced in America about the year 1908. Discharge printing stamps upon colors dyed in the cloth acids or alkalies that remove the colors or the mordants, producing patterns in white upon a colored ground. Resist or reserve printing stamps upon the cloth before the dyes are applied substances that prevent the dyes or mordants from fixing themselves. The effect is similar to that of discharge printing, and to that produced in a more primitive way in the Orient by tying knots in the cloth before dyeing, or by covering certain portions with wax. The printing of woolen and silk cloths is similar to that of cotton, except that the woolen cloth requires more preparation before printing and the silk cloth less; and that silks are particularly adapted to discharge and reserve effects. (See Dyeing.) Consult: J. Persoz, *L'Impression des Tissus* (Paris, 1846); Rothwell, *Printing of Textile Fabrics* (Philadelphia, 1892); R. Forrer, *Die Kunst des Zeugdrucks* (Strassburg, 1894); Gerogievic, *Chemical Technology of Textile Fabrics* (Eng. trans. by Salter, London, 1902).

TEXTILES AND CLOTHING. Textiles and clothing taken together constitute one of the chief subdivisions of home economics, and form a subject which has to do with the chemical, physical, and biological nature of fibre, textiles, and other materials used, with the æsthetic, hygienic, and economic values of fabrics and articles of dress, with their relation to household management and with the principles governing their selection, preparation, and use. Broadly speaking, textiles include not only fabrics woven from wool, cotton, silk, linen, and other familiar natural fibres of animal or vegetable origin, but also those made from inorganic substances, such as asbestos, glass, and metal, and from synthetic materials, like artificial silk. Clothing includes all natural and manufactured articles used to cover the body, to defend it from injury, annoyance, the elements, or public gaze, or for purposes of ornamentation; and the term, when so employed, embraces articles for the head, feet, and hands, as well as for the body, and is nearly synonymous with costume (q.v.).

The item "clothing" occupies a conspicuous place in every classified list of expenditures, whether of family or individual, often representing a financial outlay exceeded only by the expenditures for food and shelter. Statistics reported by the United States Bureau of Labor show that in the case of family incomes not exceeding $1200, about 14 per cent is spent for clothing; and, as the economist Engel demonstrated years ago, this general percentage obtains even in families of far ampler resources. Studies of the budgets of independent working women show a somewhat higher ratio of clothing to the total cost of living, and if to the sum spent for clothing there is added in all cases the cost of textiles used in house furnishing—bed and table coverings and draperies, etc.—the item assumes even greater significance. Because of the commercial importance of these two commodities and of the large sums now invested in their manufacture, problems connected with their production and use are of social as well as of household importance.

As the result of investigations in government, commercial, and private laboratories, information concerning the nature and properties of textile fibres is constantly accumulating, and many of the facts thus obtained have important bearing on practical questions. Scientists who are studying methods of producing the various fibres are discovering distinctive characteristics of each which serve as a foundation for tests of purity. Others are studying fibres or fabrics with reference to their tensile strength, wearing qualities, reactions towards dyes or cleaning materials, or other matters connected with permanence of color or durability. Still others are studying clothing with reference to porosity, capillarity, hydroscopicity, and conductivity of heat or moisture, in order to throw light upon the relation of dress to comfort and health. The fine arts, too, are the source of much information, chiefly concerning color combinations and designs.

In spite of the rapid increase of knowledge, development of the subject along economic and educational lines has been slow—a circumstance attributable, no doubt, to the fact that fashion has introduced an element which, though elusive and immeasurable, has a well-recognized effect upon values and has interfered with the establishment of standards for judging these commodities based on durability and æsthetic considerations. An expenditure for clothing, for example, unwarranted by health or beauty, may be justified under present conditions of employment by its effect upon the earning capacity of the wearer. It is more difficult, therefore, than in the case of food and shelter to distinguish between necessities and luxuries, and educators have been handicapped in their efforts to organize the subject for teaching purposes.

When household methods of production prevailed, there was an almost universal need among women for training in technical processes—spinning, weaving, sewing, and others—but these were taught by one person to another and formal instruction was almost unknown. With the extension of educational systems to include manual training, courses in sewing and dressmaking were introduced into many schools. These have found favor because, besides training the hand they enrich the general education and are of practical value in the home and as preparation for self-support. Of late, however, need has arisen for the training that enables one to judge of textiles and to understand the hygiene of dress, and this must be based on scientific data. The result is that the subject has been so enlarged on the scientific side that it is finding a place in many colleges and universities. In these institutions, however, the chief emphasis is not upon technique, but upon the historical, scientific, and economic aspects of the subject. Consult: E. H. Richards, *The Cost of Living as Modified by Sanitary Science* (3d ed., New York, 1905); J. M. Matthews, *Textile Fabrics: Their Physical, Microscopical, and Chemical Properties* (2d ed., ib., 1907); Kinne and Cooley, *Clothing and Textiles* (ib., 1913); Woolman and McGowan, *Textiles: A Handbook for the Student and Consumer* (ib., 1913); Barker and Midgely, *Analysis of Woven Fabrics* (ib., 1914). See Home Economics and references there given.

TEX'TUAL CRITICISM (OF., Fr. *textuel*, from Lat. *textus*, text, composition, fabric, from *texere*, to weave). The criticism of existing texts of literary works with a view to the detection of errors which have crept in, and the restoration of the reading intended by the author. Such criticism may be necessary in the case of any literary production which is no longer under the control of its author, but it finds its most difficult problems in the Old and New Testaments, the Greek and Latin authors whose works are preserved to us, in the older monuments of the national literatures, and in the texts of some modern writers, e.g., Chaucer and Shakespeare.

The criticism of the texts of Greek and Latin authors, to take them as examples, is based first of all on a careful study and comparison of all existing manuscripts, then on quotations and unconscious reminiscences of the writer in question, in other Greek or Latin authors, and finally on such helps as may be obtained from ancient commentaries, *Scholia* (see SCHOLIASTS), or from early translations, such as the Latin and Arabic renderings of certain works of Aristotle. Most classical manuscripts belong to the period from the ninth to the fifteenth century; a few are earlier, one or two possibly as old as the fourth century, and some are later, but ordinarily the manuscripts of the fifteenth and sixteenth centuries are of little or no value. No existing manuscript is free from error. The scribes often did their work mechanically and ignorantly; the blunders thus made were perpetuated and spread by each successive copyist. Such errors may be corrected by comparison with a manuscript which does not contain the identical blunders; but in case all existing manuscripts are descended from the same incorrect original, or archetype, the same errors will probably appear in all. In such case, if the subsidiary aids named above fail, the only resort is to conjectural emendation. Or it may happen that a number of manuscripts have different readings in the same passage, all intelligible. The problem then is to determine which of the several readings is the one intended by the author.

Errors in manuscripts may be divided into: (1) Errors of Omission, (2) Errors of Insertion, (3) Errors of Substitution, (4) Errors of Transposition, (5) Errors of Emendation, (6) Errors due to the Confusion of Letters or Contractions.

(1) *Errors of Omission.*—The simplest form of this class of errors is that known as haplography, when of two identical letters, syllables, or words only one is written; e.g., Plautus, *Miles Gloriosus* 54, *si viverent for sivi viverent;* Vergil, *Georgics*, 4, 311, *magis aera carpunt* for *magis magis aera carpunt*. The omission of a syllable, word, or passage may also be due to the inexcusable carelessness of the scribe, a failure to understand, a defect in the archetype, etc. Most such omissions come under the head of what is technically known as lipography. Examples are furnished by Vergil, *Æneid*, 4, 491, *descere* for *descendere;* 6, 708, *indunt* for *insidunt*. The omission of clauses or sentences in prose, or of whole lines in poetry, is frequently occasioned by the similar endings of clauses or verses (homœoteleuton), or by similar words in the same position within the lines, so that the eye of the scribe jumped from one to the other. In Plautus's *Bacchides*, the oldest manuscript lacks two entire verses, owing to the fact that v. 507 has *atque* and v. 509 *usque* in the same position. The texts of Lucretius and Vergil also furnish examples of this kind of error.

(2) *Errors of Insertion.*—One of the most common forms of this class of errors is that known as dittography, whereby a letter, syllable, or word is written twice. A case of double dittography is furnished by the Palimpset of Cicero, *De Republica*, 2, 57, *secvtvtvsecvtvs* for *secutus*. Often an explanatory word, gloss, or passage, either interlinear or marginal, is inserted in the body of the text. Thus in Plautus's *Truculentus*, v. 79 is an unmetrical line, *Phronesium, nam phronesis est Sapientia*, which apparently was originally a marginal gloss in explanation of the proper name *Phronesium* in v. 77. Or any marginal note may be incorporated by the scribe, such as *caput*, chapter, *nota*, take notice, *deest*, there is lacking, etc. In some cases insertions have been made with fraudulent intent. There is an ancient tradition that the mention of Athens in the *Iliad*, 2, 533 ff., was interpolated to give the dignity of antiquity to the capital of Attica. Syntactical corrections, both intentional and unintentional, from a difficult to an easier construction are not uncommon; and Renaissance scholars seem often to have been more concerned with making a readable than with making a correct text.

(3) *Errors of Substitution.*—This class of mistakes may arise from various causes. An explanatory gloss may have been substituted for the word it explains, as in Vergil, *Eclogues*, 6, 40, *rara per ignaros errent animalia montis*, where some manuscripts have *rara per ignotos*, etc., *ignotos* being evidently a gloss substituted by some copyist for the correct *ignaros*. In the case of archaic writers like Plautus, a classical word may have ousted the early form; an example is furnished by *Amphitruo*, 631, where one manuscript has the classical *simul* for the archaic *simitu*. The earlier form is correctly given by two manuscripts, while the writer of a fourth first copied correctly *simitu* and then changed it to *simul*. Not infrequently, also, a word has been substituted from the context or from a parallel passage which lingered in the copyist's mind. Further, the mediæval scribes, being monks, might corrupt a passage by substituting a word from a similar passage in the Bible. A famous example is that of Horace, *Odes*, 3, 18, 11, where the monk who was writing a manuscript which afterward became the archetype of a considerable class had in mind Isaiah xi. 6, *habitabit lupus cum agno et pardus cum hœdo accubabit*, and so substituted *pardus* for *pagus* in the passage *festus in pratis vacat otioso cum bove pagus*. The most common cause of this class of errors, however, is the confusion of similar words: *addit* and *adit*, *adesse* and *ad sese*, *hospitium* and *hostium*, *precor* and *prætor*, etc.

(4) *Errors of Transposition.*—These errors, whether of letters, syllables, words, or lines, are very common in classical manuscripts. They are due most often to the carelessness of the copyist whose eye traveled faster than his pen. Transposed letters and syllables are easily detected by any one familiar with the language; transposed words are not so readily discovered in prose as in verse, for in verse the transposition usually spoils the metre; so, e.g., the reading of certain manuscripts of Horace, *Odes*, 3, 13, 14, *ternos ter attonitus cyathos petet vates* will not scan, but the metre is perfect when the correct *cyathos attonitus* is read. The transposition of entire lines is generally due to the fact that the copyist carelessly dropped the line or lines, and later, on discovering his error, inserted the missing lines out of place, often without any indication of the misplacement. Lucretius and Vergil furnish many excellent examples. Finally, one or more entire pages may be misplaced either because the scribe carelessly

omitted a page or because the sheets of the archetype had become disturbed before the copy was made. A well-known example of the last is furnished by Lucretius, where the error enabled Lachmann to determine the size of the lost archetype from which the extant manuscripts are descended.

(5) *Errors of Emendation.*—These errors have been touched on under sections 2 and 3. They occur chiefly in manuscripts dating from the ninth century or later, and are especially common in manuscripts written by Renaissance scholars. These errors may arise simply from the wrong division of words, as in Seneca, *Epist.*, 89, 4, where the copyist senselessly divided *quid amet* of his original into *quidam et*. Madvig, by a stroke of the pen, first restored the correct *quid amet*. While Alcuin's efforts to restore Latin orthography were for the most part beneficial, they also led to certain errors, mostly due to the substitution of a familiar for an unfamiliar word, e.g., *facile* for *facete*, etc. Renaissance scholars of the fifteenth and sixteenth centuries not only corrected passages, but also filled out lacunæ, supplied missing scenes, etc.

(6) *Errors Due to the Confusion of Letters and Contractions.*—These mistakes are few in capital and uncial writing, but in minuscule writing the possibilities of the confusion of letters are much greater, and the use of contractions constantly increased with the centuries. A treatment of the subject is impossible here, as it belongs to paleography (q.v.).

Bibliography. For a bibliography of the text criticism of the Bible, see articles on Bible, Biblical Criticism, etc. On the text criticism of classical authors, consult Boeckh, *Encyklopädie und Methodologie der philologischen Wissenschaften* (2d ed., Leipzig, 1886); Madvig, *Adversaria Critica*, 3 vols. (Copenhagen, 1871–74); Cobet, *Variæ Lectiones* (2d ed., Leyden, 1873); F. Blass in Mueller's *Handbuch der klassischen Altertumswissenschaft*, vol. i (2d ed., Munich, 1892); W. M. Lindsay, *Introduction to Latin Textual Emendation* (London, 1896); H. T. Peck, *A History of Classical Philology* (New York, 1911); F. W. Hall, *A Companion to Classical Texts* (Oxford, 1913); Th. Birt, *Kritik und Hermeneutik nebst Abriss des Antiken Buchwesens* (Munich, 1913); and the best critical editions of the separate authors, such as the edition of Vergil by O. Ribbeck, of Lucretius by Lachmann and Munro, of Horace by Keller and Holder, and of Plautus by Ritschl-Goetz-Löwe—Schoell.

TEYTE, tāt, Maggie (1890–). An English lyric soprano, born in Wolverhampton. Having received her entire musical education under Jean de Reszke in Paris, she made her début at Monte Carlo in 1908 as Zerlina in Mozart's *Don Giovanni*. For the next two years she was a member of the Opéra Comique, where Beecham heard her and engaged her for his first operatic season in London (1910). In 1910–15 she was a member of the Chicago Opera Company and also made extensive concert tours of the States. Her favorite rôles were Mimi in *La Bohème* and Mélisande in *Pelléas et Mélisande*.

TEZCUCO, tās-kōō'kō, or **TEXCOCO**, tās-kō'kō. A town in the State of Mexico, Mexico, sixteen miles east of the city of that name, east of the Lake of Tezcuco (Map: Mexico, E 8). It is on the Interoceanic Railway, whose shops form its chief industry. It also has glass and cotton manufacture. In the plaza is a monument to Netzahualcoyotl, the most famous Tezcucan king. Previous to the Spanish conquest the place was occupied by a Chichimeca tribe, known as the Texcucans or Acolhuans, who claimed a preëminence in Nahuatl culture and civilization. Here, in 1521, Cortés built the brigantines with which he besieged Mexico. Pop., 1900, 5930.

TEZIUTLAN, tā'sē-ōōt-län'. A town of the state of Puebla, Mexico, seventy-six miles northeast of Puebla, and thirty-seven miles northwest of Jalapa (Map: Mexico, K 8). Its streets are steep and irregular. It has an extensive commerce with Mexico City and with the towns of Vera Cruz. Pop., (est.) 15,000.

THAALIBI, thä-lē'bē (Ar. *Abū Manṣūr Abd al Malik ibn Muḥammad ibn Ismā'īl al Tha'ālibī*) (961–1038). A prolific writer upon philological and literary subjects. He was a native of Persia, his birthplace being Nishapur, and he represented the Persian-Arabic school of literature. Arabic philology was now passing from the ancient schools of Basra and Kufa to Persian soil. Thaalibi's great anthology, *Yatimat al dohr*, is an invaluable source of information concerning Moslem poets, and reveals critical judgment as well as erudition. Portions of Thaalibi's works have been edited in Europe and translated, e.g.: J. Seligman, *Proœmium et Specimen Lexici Synonymici Arabici Atthalibi* (Upsala, 1863); P. Cool, *Selecta ex Thaalebii Libro Facetiarum* (Leyden, 1835); J. Ph. Valeton, *Talibii Syntagma Dictorum Brevium et Acutorum* (Leyden, 1844); Fr. Dieterici, *De Anthologia Arabica Tsaalebii Unio Ætatis Appellata* (Berlin, 1846). Consult: C. Brockelman, *Geschichte der arabischen Litteratur* (Weimar, 1898); R. Nicholson, *Literary History of the Arabs* (New York, 1907).

THACH'ER, James (1754–1844). An American physician and writer, born in Barnstable, Mass. From 1775 to 1783 he was a surgeon in the Revolution. Afterward he practiced in Plymouth, Mass., until his death. Thatcher is best known through his *Military Journal during the American Revolutionary War* (1823), and *Observations Relative to the Execution of Major John André as a Spy in 1780* (1834). In these books he supported Washington's treatment of André (Thatcher had been stationed at West Point in 1780). Among his medical books was an *American New Dispensatory* (1810; 4th ed., 1821).

THACHER, John Boyd (1847–1909). An American manufacturer, writer, and book collector, born in Ballston, N. Y. He graduated at Williams College in 1869 and settled at Albany, N. Y., where he became a successful manufacturer of car wheels. In 1884–85 he was a Democratic member of the State Senate, taking an especial interest in tenement house reform; and in 1886, 1887, 1896, and 1897 he was mayor of Albany. His publications include: *The Continent of America, Its Discovery and Its Baptism; An Essay on the Nomenclature of the Old Continents, etc.* (1896); a drama, *Charlecote: or The Trial of William Shakespeare* (1896); *The Cabotian Discovery* (1897); and *Christopher Columbus, His Life, His Works, His Remains, together with an Essay on Peter Martyr of Anghera and Bartolomé de las Casas, the First Historians of America* (2 vols., 1903); an important work, made especially valuable by the publication of many original documents and of various early accounts of the life and voyages of Columbus; *Outlines of the French Revolution told in Autographs* (1905).

THACHER, Thomas Antony (1815–86). An American educator, born in Hartford, Conn. He graduated at Yale in 1835, was appointed tutor there in 1838, and, in 1842, professor of Latin, a position which he held during the remainder of his life. In 1843 he went to Germany and for a time gave instruction in English to the Crown Prince of Prussia and to Prince Frederick Charles. He was one of the editors of *Webster's Dictionary* and also edited many of the Latin classics, such as Cicero's *De Officiis* (1850), and made an English version of Madvig's *Latin Grammar*.

THACK'ERAY, Anne Isabella. See Ritchie, Anne Isabella.

THACKERAY, William Makepeace (1811–63). A famous English novelist. He was born in Calcutta, where his father was at the time in the service of the East India Company, July 18, 1811. At the age of six he was sent to England, his father having died, and placed in the care of an aunt; but in 1821 his mother returned with her second husband and settled near Ottery Saint Mary in Devonshire. The boy regarded her as "a daughter of the gods" and his stepfather, it is asserted, was the original of Colonel Newcome, whom, in certain traits, he did as a matter of fact resemble. After attending two small schools, Thackeray entered Charterhouse, also vividly described in *The Newcomes*, and remained there six years (1822–28). Then he spent a little over a year at Cambridge as a member of Trinity College and of the brilliant society of which Tennyson (q.v.) was one. Then during two years abroad he met Goethe at Weimar. On his return to England he studied law for a while at the Middle Temple, which furnished material for *Pendennis*. On his coming of age, he inherited a fortune of now indeterminate size, but variously estimated at £20,000 and £500. At all events, much of it was lost by the failure of an Indian bank, and a quantum of it at play, and he had to depend on his own exertions for a living. In 1833 he became editor and proprietor of the *National Standard*, a periodical devoted to art and literature, but it lived only about a year, after which he spent some time in Paris studying art. He offered to illustrate *Pickwick*, but his services were declined by Dickens. In 1836 he became Paris correspondent for the *Constitutional*, and married there Isabella, daughter of Colonel Shawe of Doneraile, County Cork.

After his marriage he settled in London and contributed regularly to *Fraser's Magazine*, and was busy with his pencil also. His first book was *Flore et Zéphyre by Théophile Wagstaff* (1836), with nine comic plates from his own drawings. To *Fraser's* he contributed *The Yellowplush Papers* in 1838. Then followed *The Paris Sketchbook* (1840), and *The Irish Sketchbook* (1843). In 1842 he began writing for *Punch*, to which he contributed nearly four hundred sketches. The most successful were "Jeames's Diary" (1845–46), the "Prize Novelists" (1847), and the "Snob Papers" (1846–47). Thackeray had now proved himself a master of burlesque, and an acute critic of contemporary manners. In their kind nothing could be better than the "Prize Novelists," in which he exaggerates the weaknesses of Bulwer, Disraeli, Lever, Cooper, and Scott. *Barry Lyndon* (1844) was slow in winning the recognition which later criticism has given it in justly declaring it to be, in the concentrated power of its satire, in its literary economy and in other literary qualities one of his very finest achievements. He had also begun, as he continued throughout life, to write occasional verse, commonly in the ballad measure, at will grave and pathetic or richly humorous.

In 1847–48 *Vanity Fair* appeared in monthly parts, and Thackeray assumed his place in English literature by the side of Fielding. This, with his other great novels, *Pendennis* (1848–50), *Henry Esmond* (1852), and *The Newcomes* (1853–55), shows him at the height of his power. Like *Vanity Fair*, the last three named novels appeared in monthly installments. Somewhat inferior, but still to be mentioned in this context, are *The Virginians* (in monthly parts (1857–59) and *The Adventures of Philip* (1862). *Henry Esmond*, especially, has taken rank by universal consent at the head of English historical fiction. With its other merits, it is on the whole a wonderfully faithful reproduction, not only of the language, but of the thought and the manners of the early eighteenth century. This was a period by which Thackeray was always strongly attracted; Addison, Swift, Steele, and the eighteenth-century novelists were his masters in literature. He even thought of writing a history of the century; and his studies took shape in the delightful lectures on *The English Humorists*. These he delivered in America in 1852 and 1853 with such success that he came again in 1855 with *The Four Georges*. In 1857 he tried for Parliament, standing for Oxford in the Liberal interests, but was fortunately defeated. In 1860 he became the first editor of the *Cornhill Magazine*, for which he wrote his last novels, *Lovel the Widower* (1860), *The Adventures of Philip* (1862), and the beautifully written *Denis Duval* (1864). In the *Cornhill* appeared (1860–63) the *Roundabout Papers*, models of the familiar essay, which represent his style in its ripest perfection.

Though not far beyond middle life, Thackeray felt the burden of years, and resigned the editorship of the *Cornhill* in April, 1862. On the morning of Dec. 24, 1863, he was found dead in his bed. He was admirable both as a man and as a novelist. Tennyson called him lovable and noble-hearted. So said Carlyle and all who knew him well. He has been often called a cynic; and indeed he was unsparing in the fierceness with which he plied the lash on anything which savored of sham or pretense, and his keen vision detected alloy in the finest natures. Yet there is a tremendous contrast between his satire and that of Swift, a cynic in truth, who hated and despised human nature and rejoiced in laying bare its weaknesses. Thackeray wrote always with a noble tenderness and with reverence for all that was good and true. Yet it must be admitted that, almost without exception, the strongest characters in his novels are the bad ones, and that he has drawn scarcely a woman whom we can love and admire without qualification.

Thackeray described the life of the upper classes, with its fringe of servants and retainers, as Dickens that of the lower; and between them they give an unrivaled picture of English life in the middle of the nineteenth century, with its characteristic notes, one may say, for the first time in the history of literature, a picture of a society whose chief concern is the making or the spending of money. The interest in social questions which he was among the first to import into fiction has never died out; though Charlotte Brontë's enthusiastic picture of him (in the preface to the second edition of *Jane Eyre*) as a prophet who comes before the great ones of society much as the son of Imlah came before the throned kings of Judah and Israel, and who speaks truth as deep, with a power as prophet-like and as vital, a mien as dauntless and as daring, may seem to us overdrawn. The most indisputable of his qualities is his mastery of a singularly pure, flexible, varied, and simple style—the natural unstrained expression of his thoughts, however lofty or however homely they may have been. "He blew on his pipe, and words came tripping round him, like children, like pretty little children who are perfectly drilled for the dance; or came, did he will it, treading in their precedence, like kings, gloomily."

Bibliography. Out of respect for Thackeray's request, no authorized biography of him has ever been written. His daughter, Mrs. Richmond Ritchie, however, has written sketches for each volume of the Biographical Edition of his works (London, 1898–99), and his son-in-law, Sir Leslie Stephen, wrote the excellent article on him in the *Dictionary of National Biography.* A good edition of the *Works* is that with introduction by Walter Jerrold (New York, 1902). Anthony Trollope's *Thackeray,* in the "English Men of Letters Series" (London, 1879), is interesting on the score of a few personal impressions, but on the whole unsatisfactory and unworthy of its subject. See also: Lewis Melville, *Life* (London, 1899), and L. S. Benjamin, *Life* (2 vols., New York, 1906). For early work, not found in the Biographical Edition, see *Unidentified Contributions of Thackeray to Punch,* edited by Spielmann (ib., 1899), and Thackeray's *Stray Papers,* 1821 to 1847, edited by Melville (ib., 1901). Consult also Hunter, *The Thackerays in India* (ib., 1897); the biography by Merivale and Marzials in the "Great Writers Series" (ib., 1891); Whibley (ib., 1903); Crowe, *Homes and Haunts of Thackeray* (ib., 1897); id., *With Thackeray in America* (ib., 1893); Wilson, *Thackeray in the United States* (New York, 1904). For criticism, consult especially the essays by Harrison, in *Early Victorian Literature* (London, 1895); Brownell, in *Victorian Prose Masters* (New York, 1901); Scudder, *Social Ideals in English Letters* (Boston, 1898); Lilly, in *Four English Humorists of the Nineteenth Century* (London, 1895); Skelton, *Table Talk of Shirley* (ib., 1895); Melville, *Thackeray Country* (New York, 1905); L. S. Benjamin, *Some Aspects of Thackeray* (Boston, 1911).

THADDÆUS, thăd-dē'ŭs (Gk. Θαδδαῖος, *Thaddaios,* a name of uncertain derivation and meaning). One of the 12 Apostles in the list given in Mark iii. 16–19 and Matt. x. 2–4 (authorized version, "Lebbæus"). In the corresponding lists in Luke vi. 14–16 and Acts i. 14 he is named Judas [son] of James, doubtless to distinguish him from Judas Iscariot. As so named he may be the Judas referred to in John xiv. 22. Some inferior manuscripts in the lists of Mark and Matthew substitute Lebbæus for Thaddæus, a reading possibly due to some scribe who, ignorant of the identity of Levi with Matthew, introduced the former into the apostolic list under this name (cf. Origen, *Contra Celsum,* i. 62, where *Lebês* is used as the equivalent of *Levein* [Levi]). Eusebius (*Hist. Eccles.* i. 13) makes Thaddæus one of the Seventy, and refers to him as sent by Thomas the apostle to Abgar, King of Edessa, in fulfilment of a promise of Christ to him to heal him of an incurable disease and to evangelize his household. Eusebius claims to have taken this story direct from Syrian sources. In the Greek *Acts of Thaddæus* he is identified with Lebbæus, and referred to as evangelizing Syrians and Armenians. The Syrian tradition embodied in the *Doctrine of Addai* makes Addai, one of the Seventy, the apostle of the Syrian church.

THAD'DEUS OF WAR'SAW. A romance by Jane Porter (1803).

THAER, târ, ALBRECHT DANIEL (1752–1828). A noted German agriculturist, whose work revolutionized certain forms of farm management and animal production of his day. Born at Celle, Hanover, he was trained as a physician, but early turned his attention to agriculture. On his farm in Celle he demonstrated the value of intensive farming, stall feeding of soiling crops, and rotation of crops in connection with potato culture. He was active in applying scientific principles to agriculture, systematizing accounts, introducing agricultural implements, and improving sheep for the production of fine wool. In 1802 he began a course of agricultural lectures, out of which grew the Agricultural Institute of Celle. In 1806 he established at Möglin, near Berlin, an agricultural institute, which became celebrated. He was appointed professor at the University of Berlin in 1810, started his famous sheep-breeding farm at Möglin in 1811, and from 1815 on had charge of the royal sheep-breeding farms, which he improved. Resigning his professorship in 1818, he devoted himself to his institute at Möglin, which was raised to a Royal Academy of Agriculture in 1824. Thaer founded and edited the *Annalen der niedersächsischen Landwirtschaft* (1798–1804), and was the author of a large number of treatises on agriculture, several of which were epoch-making. The *Einleitung zur Kenntnis der englischen Landwirtschaft* (1798; 3d ed., 1816) made his name first more widely known, and his great work *Grundsätze der rationellen Landwirtschaft* (1809–10; new ed., 1880) was translated into most of the European languages. For his biography, consult Körte (Leipzig, 1839).

THAI, tä'ē, or **TAI** (free). A group of peoples of Farther India, including the Thos (q.v.) and Muongs (q.v.) in the northeast (Tongking and China), the Shans (q.v.) in the northwest (Burma, Siam, China), the Laotians (see LAOS) in the south (the Laos States, French Siam), and the Siamese in the southwest (Siam). The term Thai is applied by certain writers to the Siamese in particular, but their proper appellation is rather Little Thai, their ancestors, the Shans, being called the Great Thai. The Thai peoples speak languages belonging to the same linguistic stock. The Siamese present the Thai type, much changed by intermixture with Khmers, Hindus, Kuis, Malays, and other stocks. They are of medium stature and brachycephalic, while the Laotians are shorter and less broadheaded. Among some of the Shan tribes the primitive Thai type is best preserved. The Thai peoples have shown much political capacity. Consult: Pellegoix, *Description du royaume Thai ou Siam* (Paris, 1854); Bastian, *Die Völker des östlichen Asiens* (Leipzig, 1866); Hellwald, *Hinterindische Länder und Völker* (ib., 1880); Forbes, *Comparative Grammar of the Languages of Further India* (London, 1881); Colquhoun, *Across Chrysê* (ib., 1883); Diguet, *Etude de la* *langue Tai* (Paris, 1896). See CHINA, *Ethnology*.

THAIS, thā'ĭs (Lat., from Gk. Θαίς). An Athenian courtesan, famous for wit and beauty. She accompanied Alexander the Great to Asia, and, according to Cleitarchus, induced him, during a festival, to set fire to the palace of the Persian kings at Persepolis (compare Dryden, *Ode to Saint Cecilia's Day*). After the death of Alexander she lived with Ptolemy Lagi, King of Egypt, who is said (by Athenæus) to have married her, and by whom she gave birth to two sons, Leontiscus and Lagus, and a daughter, Irene.

THAIS. An opera by Massenet (q.v.), first produced in Paris, March 16, 1894; in the United States, Nov. 24, 1907 (New York).

THAKURA. See TAGORE, SIR R.

THALBERG, täl'bĕrk, SIGISMUND (1812–71). A German pianist, born at Geneva, Switzerland. He was the natural son of Prince Moritz Dietrichstein and received his musical education from 1822 on at Vienna, where he studied under Hummel and composition under Sechter. His appearance in public in 1830 was a success, and he became chamber virtuoso to the Emperor of Austria in 1834, appearing in Paris (1835) as a rival of Liszt. After triumphs in England, Russia, and Italy, in Brazil (1855–56), and in the United States (1856–58), he retired to his home at Posilipo, near Naples, whence he only once more undertook a concert tour to Paris and London (1862) and to Brazil (1863). Perhaps his strongest point as a pianist was his mastery of the legato singing tone. In every other respect his style, though brilliant, was shallow.

THALER, tä'lĕr. A German coin, first struck at Joachimsthal, Bohemia, in 1519 and hence called Joachimthaler, whence the modern name. The thaler, divided into 30 silbergroschen of 12 pfennigs, was the German unit of value until 1873, when the mark was adopted. The thaler is still in circulation with the value of 3 marks, about 69 cents. See Plate II of NUMISMATICS.

THALES, thā'lēz (Lat., from Gk. Θαλῆς). The earliest of the Greek philosophers, and the founder of the Ionic or Physical school. (See IONIAN SCHOOL.) He flourished in the first half of the sixth century B.C. He was a native of Miletus, in Asia Minor, and is said to have been of Phœnician descent. He was reckoned one of the Seven Wise Men (q.v.), possessed sufficient astronomical knowledge to enable him to predict the eclipse of the sun in the reign of the Lydian King Alyattes, and was an excellent mathematician. He was famed also for his practical and political wisdom, but especially because he was the first among the Greeks to set aside the current explanations of the universe and look for a first principle (ἀρχή) which might be grasped through reason. This first principle he found in water, the source of all things, into which, also, all things were resolved. Thales left no writings, and even among the Greeks considerable doubt prevailed as to his exact teachings. Consult: Zeller, *Philosophie der Griechen*, vol. i (4th ed., Berlin, 1900); James Burnet, "From Thales to Plato," in *Greek Philosophy*, part i (London, 1914); Ritter and Preller, *Historia Philosophiæ Græcæ* (9th ed., Gotha, 1914).

THALI'A (Lat., from Gk. Θάλεια, *Thaleia*, from θάλεια, *thaleia*, luxuriant, blooming, from θάλλειν, *thallein*, to bloom). One of the nine Muses (q.v.). In the assignment of specific functions to the Muses she became the Muse of Comedy, and was represented as holding the comic mask.

THALLINE, thăl'ĭn *or* -ēn. A synthetic drug derived from coal tar. As thalline salicylate it is employed as an intestinal antiseptic and in rheumatism; as thalline sulphate it is used as an antiseptic and antipyretic and has been suggested as a substitute for antipyrine, but its effects are not so lasting, nor is the drug without danger.

THAL'LIUM (Neo-Lat., from Gk. θαλλός, *thallos*, green shoot). A metallic element discovered by Crookes in 1861, and independently by Lamy in 1862. It was originally found by the bright green line which its compounds give when examined by the spectroscope. It occurs as the selenide in combination with copper and silver, in the rare mineral *crookesite*, in small quantities in copper and iron pyrites, and in the seleniferous deposits from sulphuric acid; also in minute quantities in other minerals, and in certain mineral waters. It may be prepared from the flue dust of sulphuric acid works in which pyrites containing thallium are burned, by heating the dust with water acidulated with sulphuric acid, precipitating the resulting solution with hydrochloric acid, heating the precipitate to dryness with sulphuric acid, dissolving the resulting thallium sulphate in water, and precipitating the metallic thallium by zinc. Thallium (symbol, Tl; atomic weight, 204.0) is a soft, crystalline, leadlike metal, with a specific gravity of 11.9, and a melting point of 290° C. (554° F.). When exposed to the air it tarnishes rapidly, becoming coated with a thin layer of oxide, which preserves the rest of the metal. It combines with oxygen to form a monoxide (Tl_2O) and a trioxide (Tl_2O_3), which yield corresponding series of salts, known as the thallous and thallic compounds. The compounds of thallium are very poisonous, producing symptoms like those of lead poisoning. Their presence in a given substance may be readily detected by the beautiful green color which they impart to a nonluminous gas flame.

THAL'LOPHYTES (from Gk. θαλλός, *thallos*, green shoot, from θάλλειν, *thallein*, to bloom + φυτόν, *phyton*, plant). One of the four great divisions of the plant kingdom, containing the algæ and fungi (qq.v.). In theory the thallophytes are distinguished from the other groups by having a thallus body. As a matter of fact, there are many thallophytes with upright stemlike axes, rootlike regions of attachment, and lateral members which function as and resemble leaves, although not at all homologous with the leaves of higher plants. The best examples of these are found among the Phæophyceæ, Rhodophyceæ, and Charales (qq.v.). The thallophytes are readily distinguished from the bryophytes above them by the absence of the peculiar female sexual organ (archegonium, q.v.), and the sexless phase or plant (sporophyte, q.v.) characteristic of the bryophytes and pteridophytes. They are, therefore, defined more through the absence of structures found in the higher plants than by any agreement among themselves.

THAL'LUS (Lat., from Gk. θαλλός, green shoot). A plant body whose vegetative structure is not differentiated into such organs as stem, leaf, etc. Most of the algæ and fungi (thallophytes, q.v.) have thallus bodies. Many liverworts, the sexual phase (gametophyte) of ferns, and even certain reduced and simplified flowering plants such as the duckweed (*Lemna*), present a thalloid structure. On the other hand, certain thallophytes, especially among the brown and red algæ, have bodies differentiated far beyond the limits of the definition of a thallus.

THAMES, tĕmz. The most important river in Great Britain, flowing with a southeastern trend through the southern portion of the Kingdom and passing through London (Map: England, G 5). Its headwaters, rising on the southeast slope of the Cotswold Hills, in Gloucester, five miles south of Cheltenham, converge on Oxford and flow thence in a southeasterly direction to Reading, through a gap in the Chiltern escarpment. The Thames thereafter follows a generally eastward trend. A few miles below Gravesend it expands into a wide estuary, and enters the North Sea. Its length is about 215 miles. The upper part of the river is sometimes called the Isis. At London Bridge the width of the river is about 290 yards; at Woolwich, 490 yards; at Gravesend pier, 800 yards; 3 miles below Gravesend, 1290 yards; at Nore Light, 6 miles; and at its mouth, between Whitstable and Foulness Point, about 8 miles below the Nore, the estuary is 18 miles across. The river is navigable for barges to Lechlade, upward of 200 miles above its mouth, and it is connected with several important canals, affording communication with the west and south coasts, and with the interior of the country. Its upper reaches and islands are much resorted to for their sylvan beauty, and pleasure steamers ply daily between Kingston, Henley, and Oxford. The London docks now embrace 35 miles of the river from the Tower Bridge to Tilbury Dock and the largest steamships are moored at these docks. While the upriver docks are tidal, the lower ones admit any vessel at any stage of the tide. On the average a vessel arrives at the port of London every 10 minutes. The Thames is also the main source of the water supply of London, the daily supply delivered exceeding 225,000,000 gallons. The part of the river immediately below London Bridge is called the Pool, and the part between the bridge and Blackwall is called the Port. Two embankments have been formed, one on the north shore from Blackfriars Bridge to Westminster, and one on the south shore from Westminster Bridge to Vauxhall. Among the places on the Thames besides those above mentioned are Windsor, Eton, and Richmond. Consult: H. W. Wack, *In Thamesland* (New York, 1906); T. R. Way, *The Thames from Chelsea to the Nore* (ib., 1907); Hilaire Belloc, *Historic Thames* (ib., 1907); T. H. M. Howe, *The Thames* (ib., 1911); G. E. Mitton, *The Thames* (ib., 1914). See London.

THAMES, tĕmz, or **GRA'HAMSTOWN**. A gold-mining town on the east coast of the Firth of Thames, an inlet in the Hauraki Gulf, North Island, New Zealand, 40 miles east-southeast of Auckland (Map: New Zealand, N., B 4). Pop., 1911, 4104.

THAMES, tĕmz; *locally, also* thāmz, tāmz. A river of eastern Connecticut (Map: Connecticut, G 4). It is a broad and navigable tidal estuary, 15 miles long, receiving the Shetucket, and entering Long Island Sound at its eastern end. At its mouth stands New London, and at its head Norwich. The Shetucket and its branches supply power for considerable manufactures.

THAMES, Battle of the. A battle fought at the Moravian settlement on the Thames River in the township of Oxford, Ontario, Canada, on Oct. 5, 1813, during the War of 1812, between an American force of about 3000 (largely Kentucky volunteers) under Gen. William H. Harrison and a British force of about 650 under General Proctor, aided by a force of Indians, whose number has been variously estimated at from 800 to 2000, under Tecumseh. For days Proctor had retreated before Harrison, but had at last decided to give battle and had drawn up his troops to receive the advancing Americans. The battle was begun and virtually decided by a cavalry charge under Col. Richard M. Johnson, who has been credited with having personally killed Tecumseh. The British broke, and fled from the field, with Proctor at their head; the only serious resistance was that of the Indians. The American loss in killed and wounded was reported by Harrison as 29; that of the British was about 35, a large number being taken prisoners. The Indian loss is not definitely known, but it does not appear to have been large. Proctor was soon afterward disgraced for his conduct during the battle. Johnson contended that the battle was fought and won by his regiment of mounted Kentuckians. By this battle the right division of the British army in Upper Canada was greatly weakened, and as the result of Tecumseh's death the powerful Indian confederacy in the Northwest against the United States was broken up.

THAMES EMBANKMENT. An important public work in London consisting of broad roads along the Thames, protected on the river side by massive granite walls. The finest portion, the Victoria Embankment, on the north bank of the river, between Blackfriars Bridge and Westminster, was constructed in 1864–1870. It has a carriageway 64 feet wide, flanked by broad footwalks, and is planted with trees and adorned with gardens containing statues of notable men. The obelisk known as Cleopatra's Needle stands near the Adelphi Steps. The Albert Embankment on the right bank, between Westminster Bridge and Vauxhall Bridge, with a 60-foot roadway, was completed in 1869, and the Chelsea Embankment, on the left bank, in 1873.

THAM'UGA'DI. Another name for Timgad (q.v.).

THAM'YRIS (Lat., from Gk. Θάμυρις). A Thracian bard who challenged the Muses to a contest of singing. He was overcome by them and as a punishment was blinded and deprived of his gift of song.

THAN'ATOP'SIS (Neo-Lat., from Gk. θάνατος, *thanatos*, death + ὄψις, *opsis*, sight, view). A well-known poem by William Cullen Bryant, written in 1811, and published in 1817.

THAN'ATOS (Gk. θάνατος, death). The Greek god of death, called by the Romans Mors, and twin brother of Sleep (see Somnus), with whom he is usually represented.

THANE (AS. *þegen, þegn*, OHG. *degan*, attendant, servant, soldier, Ger. *Degen*, heroic warrior), or Thegn. The name by which the class of minor nobles was known in Anglo-Saxon times. Any freeman who had acquired five hides of land and a special appointment in the King's hall became a thane. He was bound to service in war, but was protected by a higher wergild (q.v.) than the ordinary freeman. Like the gesith, who was the noble living with the King, the thane was a development from the Germanic comitatus or noble follower of some chief, described by Tacitus. After the Norman Conquest the thanes were merged in the class of knights. In Scotland, however, it was long used as a designation of high rank, e.g., the chief of a clan.

Consult Sir William Stubbs, *Constitutional History of England*, vol. i (6th ed., Oxford, 1897).

THANE OF CAWDOR. See CAWDOR.

THAN′ET, ISLE OF. The northeast corner of Kent (q.v.), England (Map: England, H 5). It is 8 miles in length and from 4 to 6 in breadth. Agriculture is successfully pursued. It contains the well-known watering places, Ramsgate, Margate, Westgate, and Broadstairs. Pop., 1901, 68,350; 1911, 72,574. Consult Simson, *Historic Thanet* (London, 1891).

THANET, OCTAVE. See FRENCH, ALICE.

THANKSGIVING DAY. In America, the name of a national holiday, which originated in New England. After the first harvest of the New England colonists in 1621 Governor Bradford made provision for a day of thanksgiving and prayer. In 1623 a day of fasting and prayer in the midst of drought was changed into thanksgiving by the coming of rain during the prayers; gradually the custom prevailed of appointing thanksgiving annually after harvest. These appointments were by proclamation of the Governors of the several New England Colonies. During the Revolution a day of national thanksgiving was annually recommended by Congress. In 1817 New York adopted it as an annual custom, and it spread through many of the States by the middle of the nineteenth century. In 1864 President Lincoln appointed a day of thanksgiving, and since then the presidents have issued a Thanksgiving proclamation, generally designating the last Thursday of November. The memory of its origin as a State appointment survives in the proclamations of the governors of the States, which follow that of the president. Consult Love, *The Fast and Thanksgiving Days of New England* (New York, 1895).

THAR, thär (East Indian name), or TAHR. A goat antelope (*Hemitragus jemlaicus*) allied to the Nilgiri goat (see NILGAI), which inhabits the higher forest regions of the southwestern Himalayas. It is about 3⅓ feet tall. It is usually dark brown, but variable, and lighter in winter. The female is singular in having four teats. The horns are black and bend backward. This species is known in Kashmir as kras, and in Nepal as jharal. See Plate of GOAT ANTELOPES.

THARAUD, tȧ′rō′, JÉRÔME (1874-) and JEAN (1877-). French novelists, brothers, both born at St. Julien. Their literary partnership was so close that when they signed their joint work "J. J." it was impossible to distinguish between them. (For similar collaborations, see articles on the brothers GONCOURT, MARGUERITTE, and ROSNY.) The Tharauds were awarded the Goncourt prize in 1906. They wrote: *Le coltineur débile* (1899); *La lumière* (1900); *La légende de la Vierge* and *Dingley, l'illustre écrivain* (both 1902); *Contes de la Vierge, Les moines de l'Athos*, and *Les hobereaux* (all 1904); *La ville et les champs* (1906); *Bar cochebas* (1907); *La maîtresse servante* (1911); *La fête arabe* (1912); *La tragédie de Ravaillac* (1913); *La bataille de Scutari et d'Albani* (1913).

THA′SOS (Lat., from Gk. Θάσος). The most northerly island in the Ægean Sea, a few miles off the coast of Macedonia (Map: Greece, F 3). Circumference, about 40 miles; pop., 1914, according to Baedeker, about 12,000, mostly Greeks, scattered over 8 villages. Thasos is mountainous, the chief summit, Hypsarion, being about 3400 feet in height, and is, on the whole, barren. It exports some oil, honey, wax, and timber. The island seems to have been the seat of a Phœnician trading post in very early times, but near the end of the eighth century B.C. it was colonized by Parians. The settlers had a severe struggle with the natives before possessing the island and its rich gold mines. They later reached the neighboring coast, where gold was also found, and became very wealthy. Thasos submitted to the Persians, but after the defeat of Xerxes joined the Delian League. After an attempt to revolt, it was reduced by the Athenians, who held it for most of the time until the end of the third century B.C., when it passed into the hands of Macedon. After the battle of Cynoscephalæ (197 B.C.) Thasos long enjoyed autonomy under the Romans. Consult: Conze, *Reisen auf den Inseln des thrakischen Meeres* (Hannover, 1860); H. F. Tozer, *Islands of the Ægean* (Oxford, 1890); Jacobs, *Thasiaca* (Göttingen, 1893); J. Baker-Penroye, in *Journal of Hellenic Studies*, vol. xxix (London, 1909); K. Baedeker, *Konstantinopel, Balkanstaaten, Kleinasien, Archipel, Cypern* (2d ed., Leipzig, 1914).

THATCH, EDWARD. See TEACH, EDWARD.

THATCH′ER, HENRY KNOX (1806-80). An American naval officer, born at Montpelier, near Thomaston, Me. He entered the navy as a midshipman in 1823; rose through successive grades to the rank of commodore in 1862 and to that of rear admiral in 1866. In 1862 he was placed in command of the steam frigate *Colorado*, with which he joined the North Atlantic Squadron. In December, 1864, and January, 1865, he commanded the first division of Admiral David D. Porter's fleet in the attacks upon Fort Fisher, and showed so much ability that he was soon afterward appointed acting rear admiral and assigned to succeed Farragut in command of the West Gulf Squadron. In coöperation with Major General Canby he then besieged and captured the city of Mobile with its remaining fortifications and the fleet of Confederate ironclads. Soon afterward he occupied Galveston without opposition, and so completed the conquest of the Gulf coast. In 1866 he was given command of the North Pacific Squadron, a position which he held until 1868, when he was placed upon the retired list.

THAU. See AMBOINA.

THAULOW, tou′lŏv, FRITS (1847-1906). A Norwegian landscape painter. He was born in Christiania and studied at the Copenhagen Academy and under Gude at Karlsruhe. On his return to Norway he joined the new movement in art and about 1880 removed to Paris. His favorite subjects were running water, snow scenes, and nocturnes, which he interpreted with truthfulness and rare poetic charm. Fine examples are "A November Day in Normandy" (National Gallery, Berlin) and "Winter in Normandy" (Luxembourg, Paris). Other works are in the museums of Munich, Stockholm, and Christiania. He held many exhibitions in the United States, where he is very well represented in private collections, such as the Walters collection, Baltimore, and that of ex-senator Clark, New York.

THAU′MATUR′GUS. See GREGORY THAUMATAURGUS, SAINT.

THAUMATURGY, thạ′mȧ-tûr′jĭ. See LEGERDEMAIN.

THAÜN, tȧ′ĕn′, PHILIPPE DE (fl. c.1100-c.1135). The earliest Anglo-Norman poet whose work has come down to us. Little is known of him. He probably belonged to a family near

Caen, France, whence he went to England. He wrote "Li Cumpoz," or "Computus," the so-called "Livre des Créatures," about 1115. It is a poetical treatise in six-syllabled lines on the ecclesiastical calendar. Of its seven manuscripts three are in the British Museum and three in the Vatican. More important is "Li Bestiare," or "Physiologus," which the poet probably composed about 10 years later. It was dedicated to Adelaide, Queen of Henry I. But one manuscript has survived, viz., Cotton, Vespasian, E. x. It contains 3194 verses, consists of lines of six and eight syllables, and rhymes in couplets. It is the first French bestiary based on the Latin Physiologus, one of the most noteworthy of the bestiaries (q.v.). Philippe groups his creatures as beasts, birds, and stones, and treats each creature as a symbol. His allegories are in general naïve; those of a dove and the pelican are not without beauty. He is more valuable for his linguistic legacy in connection with the *langue d'oïl* than for his poetic talents, which were in fact poor. Consult Mall, *Li Cumpoz de Philippe de Thaün* (Strassburg, 1873), and Walberg, *Le bestiaire de Philippe du Thaün* (Paris, 1900).

THAUSING, tou'sĭng, Moritz (1838–84). An Austrian art historian. He was born near Leitmeritz, Bohemia. He studied history and Germanic philology at the universities of Prague, Vienna, and Munich, and in 1868 became curator of the Archduke Albert's collection of drawings and engravings in the Albertina, Vienna. In 1873 he was called to the University of Vienna as professor of art history. Thausing was an able pioneer in research on Albrecht Dürer. His chiefs works are: *Dürers Briefe, Tagebücher, und Reime* (1872); *Dürer: Geschichte seines Lebens und seiner Kunst* (2d ed., 1884).

THAW CASE. A criminal trial remarkable for the tenacity with which the issue of insanity was contested. On June 25, 1906, Harry Kendall Thaw of Pittsburgh, son of William and Mary Copley Thaw, shot and killed Stanford White (q.v.), a leading architect of New York City, at Madison Square Roof Garden. Occurrences preceding the murder involved Evelyn Nesbit, an actress and artist's model, whom Thaw had married. Thaw was indicted for murder, first degree, in January, 1907, his trial beginning Jan. 22, 1907. William Travers Jerome (q.v.), district attorney, prosecuted the action and insisted upon having Thaw examined as to his sanity, despite the defendant's opposition. The commission which examined Thaw pronounced him sane, and the trial continued. The testimony introduced was of a highly sensational nature. The jury disagreed and was discharged, certain members refusing to convict because of belief that an unwritten law was applicable. Thaw was again brought to trial in the following January (1908). It was in this trial that the terms "brainstorm" and "dementia Americana" were first employed—the former to indicate sudden, impulsive insanity, and the latter, as used by Delphin Delmas, Thaw's counsel, to describe a kind of righteous frenzy. Acquitted on the ground that he was insane when he killed White, Thaw was committed to Matteawan State Hospital for the Criminal Insane, the order of commitment providing, as usual, that he should continue in restraint until discharged by due course of law.

Immediately after entering Matteawan, Thaw obtained a writ of habeas corpus to determine whether his confinement was legal. The superintendent of the asylum opposed Thaw's release, and Jerome again appeared for the State. After several hearings this writ was dismissed on May 25, 1908, the presiding justice holding that Thaw's release would be dangerous to the public. In June an application made by Thaw for his transfer to Middletown State Hospital was denied, but in the same month he demanded a jury trial to prove his sanity. When the United States Supreme Court finally refused to review the action of the State court, refusing Thaw's application, this long proceeding was closed. The second writ of habeas corpus was dismissed Aug. 12, 1909, the third was dismissed July 26, 1912, and the fourth (issued March 1, 1913) was later withdrawn, on the ground that the scandal resulting from the Anhut incident had prejudiced Thaw's case. In November, 1912, Thaw had given John N. Anhut, a New York lawyer, $25,000 to influence the superintendent of Matteawan to procure his release. Thaw disclosed this in the criminal prosecution resulting from the bribery and later cited the value of his testimony in this action as substantiating his claim to sanity. Several legal proceedings with reference to the application of the rules and regulations of the hospital were brought during Thaw's stay at Matteawan. His right to consult with counsel unattended by guards and the number and length of visits by strangers were diligently litigated.

Thaw escaped from Matteawan, Aug. 17, 1913, in a motor car and succeeded in reaching Canada. Under deportation proceedings he returned across the border to New Hampshire. An indictment, charging him with conspiracy in effecting his escape from confinement, was unsuccessfully brought, but the State of New York, after strenuous opposition, succeeded in procuring his return to its jurisdiction on the ground that he was a fugitive from justice. The extradition proceedings, finally carried on appeal to the United States Supreme Court, were upheld by it. Brought to trial on the conspiracy charge, Thaw was acquitted by a jury and was thereupon ordered back into custody at Matteawan. On March 15, 1915, the fifth and final writ of habeas corpus was issued, and on July 16 the jury returned its verdict that Thaw was sane, thereby releasing him from custody. For a history of the Thaw case to the date of Thaw's escape from Matteawan, consult the New York *Times* of Aug. 18, 1913.

THAX'TER, Celia (Laighton) (1836–94). An American poet, born at Portsmouth, N. H. Her father was keeper of the United States Government lighthouse on the Isles of Shoals, where her girlhood and much of her after life were passed. In 1851 she married Levi Lincoln Thaxter, a Browning scholar. Mrs. Thaxter's poetry was reflective of her quiet life on the islands. It expressed with simplicity and delicacy her feeling for the sea and its perils, and also for the gentler aspects of nature. Her works include: *Poems* (1871); *Among the Isles of Shoals* (1873), a series of papers begun in the *Atlantic Monthly* in 1867; *Drift-Weed* (1878); *Poems for Children* (1884); *The Cruise of the Mystery, and Other Poems* (1886); *Idyls and Pastorals* (1886); *The Yule Log* (1889); *An Island Garden* (1894); *Stories and Poems for Children* (1895). For her son, see Thaxter, Roland.

THAXTER, Roland (1858–). An American botanist. He was born at Newton, Mass., son of Celia Thaxter (q.v.), and was educated at Harvard (A.B., 1882; Ph.D., 1888), where he was an assistant in biology in 1886–88, assistant professor of cryptogamic botany from 1891 to 1901, and thenceforth professor. In the meantime he had served as mycologist of the Connecticut Agricultural Experiment Station from 1885 to 1891. In 1907 he became the American editor of the *Annals of Botany*, an important English series, and in 1909 was president of the Botanical Society. He was elected to the National Academy of Sciences in 1912. Thaxter contributed many monographs to scientific publications, dealing particularly with the fungous diseases of insects and with cryptogamic botany.

THAYER, Abbott Handerson (1849–). An American figure, landscape, and portrait painter. He was born in Boston, Mass., and from 1875 to 1879 studied at the Beaux-Arts, Paris, under Gérôme and Lehmann, but was most influenced by the work of Bastien-Lepage. Upon his return to the United States he at first painted portraits and occasional landscapes, but soon devoted himself to ideal figure compositions. His highly individual style is characterized by broad draftsmanship, well balanced composition, and the use of color in simple strong masses. His favorite subject is a young female figure, alone or in company with one or two accessory figures, frequently members of the artist's family. They are treated with much ideality, and great dignity and charm of expression. Fine examples of his work are: "Young Woman" (Metropolitan Museum, New York); "Caritas" (Boston Museum); "Winged Figure" (Albright Art Gallery, Buffalo); "A Virgin" (Freer collection, National Gallery, Washington, which also possesses several other works), and "Virgin Enthroned." In 1884 he executed a mural decoration, "Florence," for Bowdoin College. He was an original member, and for two years president of the Society of American Artists, and was elected a member of the National Academy (1901), and of the American Academy of Arts and Letters. He made his home at Monadnock, N. H.

THAYER, Benjamin Bowditch (1862–). An American mining engineer, born in San Francisco. After graduating from the Lawrence Scientific School (Harvard) in 1885, he engaged in mining operations in Montana, California, New Mexico, and Mexico. Becoming connected with the Anaconda Copper Mining Company, he served after 1908 as its president until 1915, when the Anaconda absorbed the Amalgamated Copper Company. Thenceforth he was vice president of the greater company. In 1914 he served as president of the American Institute of Mining Engineers and in 1915 was appointed to the United States Naval Consulting Board.

THAYER, Eli (1819–99). An American educator, inventor, and antislavery agitator, born at Mendon, Mass. He graduated at Brown University in 1845, and in 1848 founded Oread Institute, a school for young women at Worcester, Mass. In 1853–54 he was a member of the Lower House of the Massachusetts Legislature. He is chiefly remembered for his connection with the Kansas Crusade, the purpose of which was to secure the admission of Kansas as a free State. With this aim in view he early in 1854 organized the Massachusetts Emigrant Aid Company; soon afterward affiliated it with the Emigrant Aid Company of New York; and a year later reorganized the two under the name of the New England Emigrant Aid Company. Local leagues were established whose members emigrated to Kansas and settled in localities (Lawrence, Topeka, Manhattan, Osawatomie) where the company had erected hotels for temporary accommodation and had provided sawmills and other improvements. The company proved a financial failure, but its main purpose was successful. (See Kansas, *History.*) In 1856 Thayer began a somewhat similar but unsuccessful work in Virginia, and founded the town of Ceredo, containing about 500 inhabitants from New England. From 1857 till 1861 he was a member of the National House of Representatives. He was also an inventor, and he patented, among other things, a hydraulic elevator, a sectional safety steam boiler, and an automatic boiler cleaner. He published a volume of Congressional speeches (1860), a collection of lectures (1886), and *History of the Kansas Crusade* (1889).

THAYER, Ezra Ripley (1866–1915). An American lawyer and educator, son of James Bradley Thayer (q.v.). He was born at Milton, Mass., and was educated at Harvard (A.B., 1888; LL.B., 1891). Admitted to the bar at Boston in 1891, he was a member of the law firm of Brandeis, Dunbar, and Nutter from 1896 to 1900, and of Storey, Thorndike, Palmer, and Thayer from 1900 to 1910. Thenceforth until his death he was Dane professor of law at Harvard and dean of the Law School. Through influence in this latter office he did much to raise the standards and improve the curriculum of legal education in the United States. In a fit of insanity he committed suicide by drowning.

THAYER, James Bradley (1831–1902). An American lawyer and author, born at Haverhill, Mass. He graduated at Harvard in 1852 and at the Harvard Law School in 1856. From that time until 1874 he engaged in the practice of law, and from the latter year until his death he was a professor in the Harvard Law School. He was the father of Ezra Ripley Thayer (q.v.). His publications include: *Letters of Chauncey Wright* (1877); *A Western Journey with Mr. Emerson* (1884); *The Origin and Scope of the American Doctrine of Constitutional Law* (1893); *The Teaching of English Law in Universities* (1892); *Cases on Evidence* (1892); *Cases on Constitutional Law* (1895); *The Development of Trial by Jury* (1896); *A Preliminary Treatise on Evidence at the Common Law* (1898); and *John Marshall* (1901). Consult the *Harvard Graduates' Magazine*, vol. x (1901–02), and the *Harvard Law Review* (April, 1902).

THAYER, John Adams (1861–). An American publisher, born in Boston. He was educated in the public schools of Cambridge, Mass., and became a printer and typefounder. He served as advertising manager of the *Ladies' Home Journal* in 1892–98, as business manager of *Munsey's Magazine* in 1898, and as advertising director of the *Delineator* from 1898 to 1903. In the latter year he joined in organizing the Ridgeway-Thayer Company, publishers of *Everybody's Magazine*, but retired from this enterprise in 1906. Thayer lived in Paris from 1906 to 1911, when he became publisher and owner of the *Smart Set Magazine*. He wrote *Astir, a Publisher's Life Story* (1910; rev. ed., 1912).

THAYER, John Milton (1820–1906). An

American soldier and politician. He was born at Bellingham, Mass., was educated at Brown University, and was admitted to the Massachusetts bar. In 1853 he went West and in the following year settled at Omaha, Neb., which he made his permanent home. In 1855 he was elected major general of the Territorial forces, and until 1861 conducted the campaigns against the Indians, in 1859 capturing the Pawnees and placing them on a reservation. At the outbreak of the Civil War he became colonel of volunteers and served with distinction till 1865. For his bravery at Fort Donelson and Shiloh he was promoted brigadier general, and assisted Sherman in the siege of Vicksburg. In 1867–71 he was United States Senator from Nebraska, and in 1875–79 Governor of Wyoming Territory. From 1887 to 1893 he was Governor of Nebraska.

THAYER, Joseph Henry (1828–1901). An American biblical scholar, born in Boston. He graduated at Harvard in 1850, and at Andover Theological Seminary in 1857. In 1864 he became associate professor of sacred literature in Andover Theological Seminary, and in 1884 professor of New Testament criticism in Harvard Divinity School. He translated the New Testament grammars of Winer (1869) and of Buttmann (1873), and published *A Greek-English Lexicon of the New Testament* (1886). He was a member of the American New Testament Company of Revisers of the Authorized Version.

THAYER, Sylvanus (1785–1872). An American soldier, known as the father of the United States Military Academy. He was born at Braintree, Mass., graduated at Dartmouth in 1807 and at West Point in 1808, and entered the corps of engineers. During the War of 1812 he served under General Dearborn as the chief engineer of the Northern army (1812); under General Hampton as aid-de-camp and chief engineer of the right division of the Northern army (1813); and under General Porter at Norfolk, Va., as chief engineer and brigade major (1814–15). The two following years he spent in Europe studying fortifications and military schools, and observing the operations of the allies. From 1819 to 1833 he was superintendent of the Military Academy at West Point, and thoroughly reorganized the institution, improving it greatly. During the following years he was employed in constructing fortifications and harbor improvements around Boston and as a member of various boards until 1858, when he was granted sick leave. In March, 1863, he was commissioned colonel of engineers and shortly afterward was brevetted brigadier general in the regular army. On June 1, 1863, he was retired from active service. He gave liberally to education, founded a free library and endowed an academy at Braintree, and founded (1867) the Thayer Engineering School at Dartmouth College.

THAYER, William Roscoe (1859–). An American author and editor. He graduated from Harvard in 1881, and became editor of the *Harvard Graduates' Magazine* in 1892. In 1914 he was elected to the American Academy of Arts and Letters, and he received honorary degrees from Harvard, Yale, Brown, and other universities. His verse includes *The Confessions of Hermes* (1884); *Hesper, an American Drama* (1888); *Poems, New and Old* (1894). In prose he published, notably: *The Dawn of Italian Independence* (1893); *History and Customs of Harvard University* (1898); *Throne-Makers* (1899); *A Short History of Venice* (1905); *Life and Times of Cavour* (2 vols., 1911); *Life and Letters of John Hay* (1915); *Germany vs. Civilization* (1916).

THAYER, William Sydney (1864–). An American physician. He was born at Milton, Mass., and was educated at Harvard (A.B., 1885; M.D., 1889). After some years on the faculty of Johns Hopkins University, he became professor of clinical medicine there in 1901. He made important investigations in malarial fevers and typhoid, and was the first to report clinically the third sound of the heart. His many essays deal with his investigations.

THE'ÆTE'TUS (Lat., from Gk. Θεαίτητος, *Theaitētos*). An important dialogue of Plato, discussing all the answers to the question: What is knowledge? The speakers are Socrates and the Athenian youth Theætetus.

THEAGENES, thē-ăj'ē-nēz. The hero of a Greek romance by Heliodorus (q.v.). See also Chariclea; Heliodorus.

THE'ATINES. A Roman Catholic religious community, which played, next to the Jesuits, the most important part in the movement for reform from within the Church in the sixteenth century. Its founders were St. Cajetan (Gaetano da Tiene) and Giovanni Pietro Caraffa, at that time Bishop of Chieti, from the Latin title of whose see, Theate, the order took its name. With two other friends, they obtained a brief of Clement VII, dated June 24, 1524, formally constituting the new brotherhood, with the three usual vows, and with the privilege of electing their superior, who was to hold office for three years. They were all to be priests. Their first convent was opened in Rome, and Caraffa was chosen as superior. He was succeeded in 1527 by Cajetan, and the congregation began to extend to the provinces. After a time, however, it was thought advisable to unite it with the somewhat analogous Order of the Somaschians (q.v.); but Caraffa, who was elected Pope, under the name of Paul IV, restored the original constitution in 1555. The Theatines extended themselves over Italy, and into Spain, Poland, and Germany, especially Bavaria. The first French house was founded in Paris under Cardinal Mazarin in 1644. To their activity and zeal Ranke ascribes much of the success of the Counter-Reformation in the south of Europe. At the present time the order numbers not more than 100 members. In 1909 Pius X united the order with the Spanish congregation of the holy family at Barcelona.

There is an order of nuns bearing this name. It was founded in Naples, in 1583, by Ursula Benincasa. It never spread out of Italy and has now only a few nunneries.

THEATRE (OF. *theatre*, Fr. *théâtre*, from Lat. *theatrum*, from Gk. *θέατρον*, *theatron*, place to view shows or plays, from *θεᾶσθαι*, *theasthai*, to view, behold, from *θέα*, *thea*, view, sight). A building used for the presentation of dramatic and similar spectacles.

Ancient. The theatre as a form of architecture was originated by the Greeks and naturally developed with the drama. At first it was simply the open space near the Temple of Dionysus, where the chorus danced about the altar of the god while the solitary actor, perhaps standing on the steps of the altar, carried on a dialogue with their leader. It is probable that at times the chorus of satyrs (see Satyr) actually drew a wagon containing the actor who impersonated the god, and who naturally addressed his companions from this vantage ground, and it is quite possible to see in such a scene the car of Thespis, with which the founder of tragedy is said to have traversed Attica. When tragedy became a state institution at Athens, set places for its performance were naturally provided; one of these was the Orchestra near the Agora, a circular dancing place which was surrounded by raised seats for the spectators. The other theatre was in the precinct of Dionysus Eleuthereus at the eastern end of the southern slope of the Acropolis, afterward occupied by the stone theatre.

The earliest Athenian theatre was simply a large circular place (ὀρχήστρα, *orchēstra*, from ὀρχεῖσθαι, *orcheisthai*, to dance) about 75 feet in diameter, near the temple. On the hill rose the seats for the spectators (θέατρον, *theatron*, in the strict sense), and these were further enlarged by artificial mounds of earth, so as to form rather more than a semicircle. The orchestra was entered by two passages (πάροδοι, *parodoi*) from the sides; these lay between the ends of the seats for the spectators and the skene (see below). The nature of the ground was such that at the rear it was raised some distance above the level of the sacred precinct, thus affording an opportunity for an underground passage, Charon's steps, by which actors could rise from the ground in the centre of the orchestra. There was at first no scenery or background, and some neighboring house was used as dressing room. In the centre of the orchestra might be an altar or tomb or other structure, probably of no great height. Such simple settings are all that seem required for the earlier plays of Æschylus, such as the *Suppliants*, *Seven Against Thebes*, and *Persians*. Soon, however, an innovation was made. A tent (σκηνή, *skēnē*) was introduced to serve as a dressing room, and this speedily became a building, apparently erected just outside the circle of the orchestra, and provided with three doors. It might represent a palace or temple or any other building called for by the play; or the front might be covered with a painted scene, as in the *Birds* of Aristophanes. During all this time actors and chorus were on the same level in the orchestra, except that gods and occasionally other characters seem to have appeared on the roof of the skene. Our knowledge of this theatre of the fifth century is partly based on the very scanty ruins of the earliest structure, and partly on the internal evidence of the plays themselves, in which there are many passages which imply that actors and chorus are on the same level, and none, with the exception above noted, that clearly imply any raised stage for the actors. In the fourth century, probably, the theatre at Athens was rebuilt in stone, the orchestra being moved farther back into the hill, and reduced to about 60 feet in diameter, stone seats were provided for the spectators, and outside the circle of the orchestra was erected a long stone skene, with projecting wings (παρασκήνια, *paraskēnia*). Later, in the Greek theatre, the orchestra became less than a circle, but regularly more than a semicircle. It seems probable that between these wings the scenery was now displayed, but there is no evidence, in the remains, of any raised stage. The old view, still held in modified form by many, is that in the fifth and fourth centuries there was a stage for the actors, probably low, in front of the skene, and that when the chorus was discontinued this was replaced by the high platform of the Hellenistic theatre. Somewhat later there was erected, a short distance in front of the skene, a low wall (προσκήνιον, *proskēnion*) about 12 feet high, composed of columns, or half columns, supporting an entablature, and with the intercolumniations filled with wooden panels. There was a door in the centre, with possibly two more, one near each side. In front of this structure the paraskenia projected but a little. The space between the skene and proskenion was roofed over, forming a platform, which varies in different theatres, but is from 10 to 12 feet in height and from about 7 to 9 feet in width. It is maintained by some that in the plays of the Hellenistic time the actors appeared on this level, as there was no chorus. On this point the evidence is far from clear, but it seems not improbable that actors in the drama proper occupied the lower level, and that this platform was for gods. In Asia Minor, under the influence of modified conditions, another type was developed by diminishing the height and increasing the width of the stage, reducing the orchestra to less than a semicircle. This operation might be described as sinking a part of the orchestra, for the lowest row of seats is frequently (as at Aspendus) on a level with the stage, and not, as in earlier Greek theatres, at the level of the orchestra. It is to be noted that this is not really a lowering and extension of the proskenion, for at the rear of the new stage appears a decorated front of columns or half columns and cornices, which forms a background to the actor, similar to that formed by the old proskenion. There was no curtain in the Greek theatre. The seats for spectators in the Greek theatre were usually laid in whole or in great part against a hillside; the Roman theatre, on the other hand, was regularly built on level ground so that huge substructures of concrete and masonry were necessary to carry the seats.

In the Roman theatre the plan is very similar in outline, but the details differ widely. The orchestra was only a semicircle, and was used commonly for seats of honor. The other half of the circle was covered by a low stage (*pulpitum*), whose depth was somewhat less than a radius of the orchestra, and its width not over two diameters of the orchestra. In the rear wall were three or five doors, and in the side walls two. Entrance into the orchestra was provided by the building of arched passages under the seats at the sides of the stage; these arched passages took the place of the parodoi of the Greek theatre. In the Roman theatre there was a curtain which worked on a roller that revolved in a wide, deep slot at the front of the stage. The curtain was lowered at the beginning of a play, raised at the close.

In Greece, outside of Athens, the chief theatres are at Epidaurus, Eretria, Sicyon, Megalopolis, Mantinea, Delphi, Oropus, and Delos. In Asia Minor Greek theatres have been studied at Pergamum, Magnesia on the Mæander, Priene, and Miletus. In Sicily and Lower Italy the Greek theatres have been altered in Roman times. Fine ruins remain at Taormina, Syracuse, Segesta, Pompeii, and Fiesole (near Florence). At Timgad, too, in Africa there are remains of a fine Roman theatre; so too in Aspendus in Asia Minor, and at Orange (ancient Arausio) in France. The last-named theatre, which is well preserved, and has been partly restored, is particularly large and imposing.

In Athens plays were performed only in connection with the festivals of Dionysus (see GREEK FESTIVALS), i.e., the Country Dionysia, the Lenæa, and the Greater or City Dionysia. It was at the latter that tragedy developed, and here the great tragedies were first produced. Comedy was at first confined to the Lenæa, but after about 465 B.C. was also part of the Greater Dionysia. At the Greater Dionysia three tragic poets competed, each producing a tetralogy, i.e., three tragedies and a satyr play. One tetralogy seems to have been performed on each of the three days. The three comedians produced only one comedy each, which seems to have followed on each day the group of tragedies. The arrangements were in charge of the Archon Eponymus, who chose the three poets from among those submitting works, and assigned to each a *choregus*, i.e., a wealthy citizen upon whom devolved the expense of the production. The production was a competition between the choruses, and the victorious *choregus* dedicated a tablet to Dionysus. The poets received a crown of ivy and a sum of money. At first it seems to have been usual for the poet to play the leading rôle. The view long held that only three actors in all were allowed in a Greek play has been challenged. After the fifth century B.C. and perhaps earlier the leading actors also competed for a prize. The profession was not dishonorable, and the actors seem to have been always free citizens, as were the chorus. Women did not appear on the stage, unless possibly as flute girls. The costume of the tragic actor was a long tunic, with close-fitting sleeves often richly embroidered, and a cloak or mantle, with sometimes a shorter tunic under the cloak. Masks were also worn, and the stature was somewhat increased by padding, a high top to the mask, and thick-soled shoes (*cothurni*), which also served to raise the actor somewhat above the level of the chorus (the use of the *cothurni* in the best period of the drama has been disputed by K. K. Smith). The dress of the tragic chorus seems to have resembled that of daily life, except of course in such cases as the Eumenides of Æschylus, where the Furies produced a great impression by their awe-inspiring appearance. The satyr chorus wore masks reproducing the typical satyr countenance, a goatskin around the loins, and *phalloi*. The comic actors wore tights, apparently often of gay colors, a short tunic and cloak, a phallus, and comic mask; the costume of the chorus varied with its character, and the poets allowed free scope to the imagination, as in the *Birds* and *Clouds* of Aristophanes. In the new comedy the dress was modified and more nearly approached that of daily life, from which the characters were taken. At the same time there was introduced a typical series of masks, so designed that the mask at once indicated the character, a device quite useful, in the absence of programmes.

At Rome the drama, like the theatre, was largely borrowed from the Greek, but it was not a state performance by citizens, at least in its developed form. The government was long hostile to the theatre, so that it was necessary to make the plays as completely Greek as possible in appearance. The actors were troupes (*greges*) of freedmen or slaves, and the plays were in general adapted from the Greek, especially in tragedy, though the *fabulæ prætextæ*, tragedies based on Roman themes, in which the hero wore the *toga prætexta* and not the Greek costume, were an attempt to treat national subjects in the Greek tragic style. In the comedy were distinguished the *fabulæ palliatæ*, based on the Greek new comedy in which the Greek cloak (*pallium*) was worn, and the *fabulæ togatæ*, treating of native life and character, and appropriately costumed. The plays were produced at public games (*ludi*), and also at the games or shows given on special occasions by private individuals. The magistrate or giver of the games paid the leader of a troupe (*dominus gregis*), who owned plays and produced them. The theatre thus never entered into or reproduced the national life in Rome as in Greece, and in later times the favorite Roman shows were the *Mimes* and the *Atellanæ*, both of which seem to have been marked by buffoonery and indecency. See MIME; ATELLANÆ.

Mediæval and Modern. During the Middle Ages theatrical performances began with dialogue additions acted out in the church service for Christmas and Easter. They developed in the twelfth century into plays in the vernacular presenting the chief events in sacred story from the creation to the last judgment. In the fifteenth century even miracles connected with the lives of the saints were told in drama. Such development made necessary performances on scaffolds by the church walls and by the fifteenth century the assignment of various plays to the amateur actors of the town or the guilds. The shipwrights, e.g., produced the play of *Noah*. Allegorical dramas depicting the contention between the personified good and evil powers of the soul for the possession of man developed fully in the fifteenth century and gave larger opportunity for acting because of realistic comic elements. In Spain the religious plays were at first produced in open town squares on a platform carried by 12 men, but later on cars or floats provided with curious mechanical contrivances. In France the prevailing type of stage was a long platform erected for the occasion, on which were represented, one beside the other, the places of action, as the garden of Gethsemane, the pretorium of Pilate, the hill of Calvary, and the mouth of Hell. The actors moved from one place to another before the eyes of the spectators. In England the commonest way was to have the separate plays in a series produced on a succession of pageants, or stages on wheels, so that the populace at any one station might witness without stirring all scenes in the processional drama. While the great towns were thus elaborately producing these religious plays there grew up for smaller places and private houses bands of strolling players. They formed a guild of their own in England as early as 1469. In Spain one of the founders of the national drama is Lope de Rueda, whom we first hear of as the head of a company of players in Benavente in 1554. His stage, according to Cervantes, "consisted of four benches arranged in a square, with four or five boards upon them, raised about four spans from the ground."

In Madrid places for the representation of all secular plays were merely the yards of houses.

The stage was at the rear. The audience stood in the courtyard, while the windows about served as boxes for the more distinguished spectators. There was no roof or other protection from sun or rain. When a theatre was built in 1574 it differed from this original in few respects. When charitable societies erected their own permanent playhouses, in the Street of the Cross in 1579 and in the Street of the Prince in 1582, they soon became the only public homes of Madrid for the greatest masterpieces in the history of Spanish drama. In them the court was paved and protected by an awning, and contained near the stage a number of portable benches. Rows of seats rose in an amphitheatre about the court beneath the boxes and galleries, and at the rear was a gallery exclusively for women. In England also these players of interludes performed in innyards, but they likewise acted in town halls and the banqueting halls of nobles. Under Elizabeth these companies increased in importance until it became a great distinction for a nobleman to have players under his protection. The most famous company is the one originally formed by the Earl of Leicester with James Burbage as leader, because Shakespeare eventually joined it, wrote all of his plays for it, and produced all of them with it. Probably the inn suggested to James Burbage some features of the first public theatre, which he erected just outside of London in 1576. It was an amphitheatre, and, somewhat like the Spanish interior, had three galleries running around it and standing room for the vulgar in the pit or central space. But his stage was a platform projecting far into the pit so that the audience was on three sides of the actor, whereas the Spanish stage seems to have been within a frame, like our modern stage without the front curtain. The most famous of London theatres, the Globe, was erected in 1598 south of the Thames. In it Shakespeare produced all his most famous plays. There was no curtain except at the rear to cut off a recess or alcove under the balcony, and another across the balcony itself, which was used to represent a tower, the walls of a city, or such a balcony as Juliet's. The curtains might be drawn aside to discover new persons or properties. More than one place was frequently indicated on the stage at once by hanging up placards over the doors or elsewhere. Properties, such as chairs, trees, rocks, booths, were much used, and the costumes were rich. Performances were given by daylight in the afternoon, a flag above the theatre announcing a play, and a bugler by a blast giving notice of the beginning of the performance. The Spanish theatre at this time also used no scenery, or almost none, except curtains of a single color at the back and the sides of the stage. In the Blackfriars, north of the Thames, which was roofed over and frequented by persons of quality, seats were provided and plays presented by candlelight.

In France the playhouses were modeled on those of Italy, where architects adapted the plans of ancient theatres to new uses. In Rome one was built of wood as early as 1514. In 1580 Palladio began to erect at Vicenza probably the first theatre of stone in Europe. It is still extant. The stage was divided by three arches, in each of which a street built in in perspective could be seen leading off to one side or the other. The Hôtel de Bourgogne, erected in 1548 by the Brothers of the Passion, who had held the privilege of acting plays since 1402, was the first public theatre in Paris. Its stage, like those for the passion play, represented several places at once. But the theatre opened by Richelieu in 1641 in his palace had a stage inclosed as by a picture frame as in a modern playhouse. The only scenery for the first production represented a colonnade and a terrace with a view of the sea. Such was the stage on which Molière produced nearly every one of his plays. The performance usually began at five o'clock. The floor, to-day called the orchestra, was then the pit, where for a few cents the common spectators stood during the performance. The gentry sat in the galleries or on wooden benches on low steps at the rear of the auditorium. His productions were very simple. For *The Misanthrope*, his masterpiece, the scene was a room in which only six chairs were needed. For a century the scenery was no more pretentious, because the smartly dressed dandies were allowed to sit on the stage and to shout to each other or to address the actors as insolently as they pleased. In fact, sometimes only one actor at a time could make his way to the front through the crowd, and in 1739 a performance of Racine's great tragedy, *Athalie*, could not be completed for this reason. In 1759 the Count of Lauraguais got rid of these spectators on the stage by giving the Comédie-Française 12,000 livres to make good the loss. During the seventeenth and eighteenth centuries most of the improvements in staging came in connection with the opera, which received in Italy a gorgeous development. Scenery was built to slide into place on grooves from the sides, so that the stage was given the appearance of great depth. Room was also provided for large troupes and for machinery needed in transformations and other scenic wonders. Lighting was arranged above, at the sides, and as footlights, below. In eighteenth-century France even Watteau did not think it beneath him to paint scenery for the Opéra and the Opéra Comique, and a similar development took place in Spain, England, and Germany. The costumes in the French theatre were lavish but utterly conventional, all heroes, e.g., appearing in Louis XIV wigs, three-cornered hats, and gilt armor.

The great transformation in the English theatre began with the Restoration in 1660. The actors now included both men and women, as had been true for several decades in French, Spanish, and Italian companies. The building was from now on a hall roofed over. The pit was filled with benches for those of modest means, while the occupants of the galleries were sharply divided socially. The hour of performance was at first three o'clock, but by the end of the century it was five, and in time was advanced to six because of the later hour for dining. Sitting on the stage, which, introduced into France, was to linger for a century yet, was permitted only on nights when the play was given as a benefit. The curtain was a long way back from the front of the stage, and as the actors played well forward and as boxes extended back to the curtain, the audience was still on three sides of the player. The space before the curtain, however, was gradually shortened into an apron stage until in the nineteenth century, hardly projecting beyond the proscenium arch, it became the now universal picture-frame stage. Scenery had first been used in 1656, and was developed during the Restoration period, particularly in opera. In the theatre the shifts were mostly flats running in grooves. The lighting was from branches or hoops of candles suspended from the ceiling. In 1765, at the height of Garrick's fame, Drury Lane had only six chandeliers, each holding 12 candles, which had to be let down at the end of every act to be snuffed. Though footlights had been common in opera for many years, Garrick after his return from France in 1765 introduced lamp footlights and seems to have made much more extensive use of such lighting in plays than had been customary. Even under these circumstances the stage would have seemed to us a dim and confusing place. The costuming was little more appropriate than in France at this period. Garrick played Macbeth in a scarlet and gold military suit of his own day, and he dressed Hotspur in a laced frock and Ramillies wig. One of his actors, Henderson, boasted of having played 10 characters in one season in the same costume. Naturally, therefore, new plays were usually produced with the stock scenery.

Theatrical history in America appears to have begun with the production of Addison's *Cato* in Philadelphia in August, 1749. The stage was set up in a warehouse on King or Water, between Pine and Lombard streets. The alleged evil influences of theatrical activity drove the Murray and Kean company to New York, where they presented *Richard III* on March 5, 1750. The advertisement shows how similar conditions were to those in England, declaring that the performance was "to begin precisely at half an hour after 6 o'clock, and no person to be admitted behind the scenes." Of the playhouse all we know is that it was a room in Nassau Street "lately belonging to the Hon. Rip Van Dam, deceased." The season continued to July 8, 1751, when the company disbanded. But it was reorganized the next year to appear in Annapolis in another reformed warehouse. A longer history is that of the American Company, organized in England and directed by Lewis Hallam, which first appeared in the colonies at Williamsburg, Va., Sept. 5, 1752, in *The Merchant of Venice*, in a building on the outskirts of the town which was turned into a theatre for the occasion. Lewis Hallam's company next appeared in New York, where he built "a fine, large theatre in the place where the old one stood." He played only on Mondays, Wednesdays, and Fridays from Sept. 17, 1753, to March 18, 1754. In April he began a two-months' season in Philadelphia in the warehouse that had been occupied by Murray and Keane. Thence he went to the West Indies. After his death Mrs. Hallam married in Jamaica David Douglass, who reorganized the company. In New York in 1758, as the Nassau house had given place to a church, he built a new theatre on Cruger's wharf, near what is now called Old Slip, not far from the Wall Street Ferry. He opened with *Jane Shore*, Dec. 28, 1758, and closed on February 7 following. His "Histrionic Academy," as he called it, must have been a very rude structure, for it was demolished soon after he left. Undaunted by the hostility in New York he built another temple of the drama in Philadelphia, on the southwest corner of Vernon and South streets, on Society Hill, opposite the famous Blue Anchor Inn, where Penn landed when he came from Chester in 1682. His brilliant season lasted for only six months on account of a law prohibiting plays. It was not till 1766 that the first permanent playhouse in America was built—the old Southwark Theatre in South Street, Philadelphia. The first-story walls were of brick, the rest of wood—all painted a glaring red. The stage was lighted by oil lamps without chimneys. The company was now known as the American Company, and presented *The Prince of Parthia* on April 24, 1767, the first American play ever presented on the stage. The first permanent theatre in New York was opened by Douglass in John Street on Dec. 7, 1767. It too was principally of wood and painted red. It had two rows of boxes, a pit, and a gallery. The dressing room and the green room were in an adjacent shed. In 1771 he erected by subscription a brick theatre in Annapolis with a seating capacity of about 600. In 1773 by the same means he erected a playhouse in Charleston, where the Southern aristocracy supported a brilliant season. After the Revolution the first handsome and complete theatre in the United States was the Chestnut Street Theatre in Philadelphia. It was modeled after the playhouse in Bath, England, and was opened on Feb. 17, 1794, by a newly organized company, chiefly from England. Scarcely inferior was the Federal Street Theatre in Boston, opened by an English company earlier in the same month. The prosperity of these years was followed at the close of the century by a period of depression.

Since the last decade of the nineteenth century the theatre has developed so enormously on all sides that it cannot easily be described in terms of anything previously existing. This change has been due, first, to the literary genius which was thrown into dramatic writing in the second half of the nineteenth century, an amount of genius greater than the theatre has had at any time since the age of Elizabeth; and second, to the rapid progress of the physical sciences, especially in electricity. These two influences have raised the theatre from the position of a third-rate institution, scarcely related to literature or the arts, to one of unsurpassed power as a cultural force and an artistic instrument. Dramatic literature, which had for two centuries been held in rigid conventional grooves, has been freed to take all knowledge as its province. All types of social questions can now be discussed in dramatic form; nearly all genres of literary production have their dramatic parallels; and all types of pictorial and plastic art can be reproduced in the scenic setting. The theatre is now the only one of the arts which makes use of all the others. In the last quarter of the nineteenth century it was absorbing artistic and literary forces from the outside; in the first quarter of the twentieth it was established as a creative force and was reflecting back new influences to the other arts.

Types of Organization. Theatres exist in many various relations to their audiences and to the money which supports them. In Germany the important theatres are operated by the state or municipality, through appointees who may or may not receive a salary. In France the state-owned theatre is generally sublet to a private entrepreneur on terms which are supposed to protect the public. In both countries public subsidization prevails. In England, where the theatres are entirely commercial, there is a sharp distinction between London and the provinces, the latter being served by traveling companies which rarely touch the capital. A few cities like Manchester have local repertory theatres, private in their business organization but semipublic in the spirit of their management. In the larger cities of Russia state endowment prevails, and for the poorer classes, both in urban and rural districts, the government has developed an elaborate system of cheap theatres, formerly supported out of the income from the liquor tax. In America we find an astonishing lack of system and stability in the business of play producing. Usually the plays are first produced in New York or some other large city by a private individual with a cast of actors hired specially for them, and then, if successful, sent on the road to play for the smaller cities as long as success continues. The method of financing these enterprises varies greatly. Sometimes the large producing firms supply the capital and the theatres; often private individuals furnish the money as a speculation, and the theatre may be rented or secured on a basis of the division of gross profits. On the road the last-named method prevails, but the theatres, though usually privately owned, are under the control of the national booking agencies, which arrange a play's tour to suit their interest.

Commercial Theatre. The commercial theatre, operated frankly for private profit, is a comparatively recent development. The view that theatrical production is primarily a business has flourished chiefly in England and America, where individual initiative has traditionally been exalted over state action. Under this system each play produced is a distinct speculative venture. An individual or corporation supplies all necessary capital, making contracts with actors and other artists contingent upon the success of the play, and in general distributing the risks as widely as possible. The failure of a play under this system becomes a loss not only for the producing individual or corporation, but also for the theatre, the actors, and the supplementary staff. This high risk tends to the inflation of prices on all sides. With the prices of seats prevailing in England and America (25 cents to $2 or $2.50) a play brings in at the maximum from 100 per cent to 300 per cent net profit per week. Because of the high risk on the one hand and the high potential profit on the other, the commercial manager tends to confine himself to those plays which have the widest possible appeal. And since these conditions have inflated abnormally the prevailing cost of theatrical production, it follows that the play of limited appeal is placed under a heavy economic disadvantage. Hence commercial production has generally been prejudicial to the special and experimental forms of dramatic art. It is to offset this condition that (in America and England) numerous semicommercial theatres have arisen, quite distinct from the commercial theatre in organization and personnel, and variously known by the names little theatre, art theatre, community theatre, and the like.

State Theatre. The state theatre (either national or municipal), which prevails throughout France and Germany, is operated on a different basis. Its success is measured not in net financial profit, but in the quality and quantity of the art product produced for a given sum of money. It is assumed that the theatre exists for the benefit of the public (as it was in earlier days for the benefit of the King patron). The state theatre always draws a subsidy from the public treasury. But this subsidy is never a blanket underwriting of future losses; it is a fixed amount advanced to cover estimated losses over a given period. For all further losses the manager is held responsible (though not always in a financial sense). In Germany the manager or intendant is usually a man of social distinction serving without pay. In provincial France he is a business man or entrepreneur, agreeing under bond to produce a certain quantity and quality of plays at a fixed tariff of prices, making good any losses out of his own pocket and receiving as his own any profits that may accrue. In either case the theatre has a stable and business-like organization. The state subsidy can hardly be said to be applied to losses; rather it is applied to reducing the price of seats, in recognition of the public utility of the institution. The theatre, with its business and artistic staff, is a business unit. Contracts are made by the year and financial speculation is reduced to the minimum. The yearly budget is a relatively constant factor, since nearly all the expenses can be foreseen. This, however, would be impossible if the yearly income were not equally constant. The cause for this stability of demand, which continues in nice equilibrium with the supply, is to be found, first, in the fact that the state theatre has usually had a monopoly over many decades and has thus been able to measure itself to the supply; and second, in the stable cultural background of the French and German peoples, which tends to create definite and homogeneous standards in the audiences.

Prices in the state theatres of France and Germany usually range between 25 cents and $1, with an abundance of special seats at from 6 to 15 cents. It is chiefly towards these latter seats that the subsidy is directed. The amounts of the subsidy vary widely. One of the largest is that given the Burgtheater in Vienna, which is more than $125,000 a year. The Royal Theatre of Berlin and the Théâtre Français in Paris receive about $50,000. In other large German cities the municipal theatre receives from $25,000 to $40,000 a season. In provincial France the subsidy varies from $20,000 to $50,000. In many cases this subsidy covers both opera and spoken drama, which are often combined in the same theatre. The larger opera houses, of course, receive much larger subsidies. The French government spends about $350,000 a year on opera and drama in Paris alone.

Endowed Theatre. Endowed theatres are essentially private in nature, and relatively few in number. They usually exist for some particular purpose, such as the exploiting of a certain type of play. The endowment may be in the nature of a blanket underwriting of losses, or it may yield merely a definite sum per year, but in either case it is devoted to a theatre which cannot be expected to pay for itself. This is not true of the state subsidized theatre. Except for a brief period of time, endowed theatres usually show little vitality. For the best artistic product the theatre should be organized on a thoroughly business-like basis. Endowments are often received by state theatres in Europe, but usually for the increasing or bettering of the artistic product in some specific way.

Subscription Theatre. The subscription theatre may be regarded as a distinct type, although it is apparently but a variation of the commercial theatre. It aims to receive, by means of season subscriptions, a definite sum of money in advance. This gives stability to its financial organization, and practically takes it out of the class of the commercial theatre of England and America. The state theatre (as well as opera the world over) rests largely on the subscription system.

Folk Theatre. A distinct type of economic organization has arisen in recent years in the theatre owned by large societies, whose membership becomes the chief constituent of the audience. This we may call the folk theatre in imitation of the German term, Volkstheater. It is ideally exemplified by the Neue Freie Volksbühne of Berlin, which normally has over 50,000 members and owns the best theatre in the city. Membership in the society gives admission to all plays produced during the season in the society's theatre, in addition to many additional privileges at special rates. The members, through their representatives, exert a considerable, though not a preponderant, influence on the conduct of the organization. Profits are devoted to a sinking fund for future needs or to some specific enlargement of the theatre's activities. The total cost of plays to members is about 30 cents each, for the best seats, and to buyers of single tickets a little more. By this scheme of organization the theatre attains the maximum of stability, and hence the highest degree of economy in theatre production which the world has yet seen. Several other large folk theatres exist in Germany and Austria. In France this type of theatre, under the name of théâtre du peuple, has been only moderately successful.

Artistic Organization. The organization of the artistic staff of a theatre (actors, directors, scene designers, costume makers, etc.) is distinct from that of its business management. Any type of the former may exist under any type of the latter. In America the commercial system recruits a new artistic staff for each production. In the foreign state theatres and American art theatres, the company is usually kept a unit for the whole season. In Germany the commercial theatres usually have a permanent company with frequent changes among the leading actors, while in Paris and London they are more fluid and approach the American commercial system more closely. In general, the more economical theatres operate with a permanent company, making their important changes in personnel only at the end of the season.

Repertory Theatre. The term "repertory theatre" is somewhat loosely used to include several types, all of which, however, have a permanent company. Usually the term refers to a producing theatre modeled after the state institutions of the Continent, which present a dozen or more new plays each season, together with many older pieces, alternating them from night to night in accordance with the public demand. The company is from two to three times as large as would be needed for an average play, and thus two plays can be in rehearsal, so to speak, while one is being performed. To a certain extent the members of the company can be specialized, some being saved for romantic parts, some for comic parts, etc. But in general a variety of ability is demanded of each member of the troupe, and the repertory company thus serves as an admirable training school for the young actor. The plays of any given week are usually highly varied in character, no piece (except a new one) running for more than two successive nights. The special economic advantage of this method is that the cost of each production is figured in with the expenses of the whole season, and a loss in the case of any unsuccessful play can be distributed over the various successful plays of the season. Further, this repertory system is the only one yet devised by which a play with a limited appeal can be made to pay for itself. This greatly increases the variety of product and hence the efficiency of the theatre.

Stock Company. The stock company, which for many decades was the chief purveyor of drama to the smaller American cities, is organized in a manner similar to the repertory theatre. The distinction between the two is largely theoretical. In common usage the repertory theatre is supposed to be first class in price and to produce its new plays in the first or second season of their theatrical life. The American stock company, on the other hand, has assumed the position of a cheap by-product of the commercial system, with a scale of prices as low as 10 to 35 cents and as high as 25 cents to $1. It may or may not be a touring company. When it is not on tour it produces plays singly for one or more weeks, and usually only those plays which are no longer running in the first-class theatre. Usually the artistic product of such stock companies is poor. A few approximate a fair standard of excellence, but these usually succumb to competition when their prices are raised.

Long-Run System. The popular term "long-run system" has become the technical name for the prevailing system of production in the first-class commercial theatre of America. It is duplicated in other countries, but nowhere has it gained such complete control over the national system of play production as in the United States. It is based upon the premise that each play is a unit of speculation and must be made to yield the highest possible gross return. A play may run as much as two full seasons in New York City alone, and at the same time be put on the road with as many as five additional companies. The gross returns from one such play must be figured in the millions of dollars. An actor is sometimes obliged to act a single part without respite for three or four years. The net profits to the entrepreneur may be many times the capital invested. Because of this tremendous margin of potential profit the commercial managers have been led to speculate freely and to expend great sums of money in the erection of theatres. The result has been a material overproduction of the theatrical commodity to fill these theatres, and a consequent increase in the risk and decrease in the average quality of theatrical production. The remuneration to stars (actors and actresses of great popularity) has been correspondingly inflated. Much money and effort have also been expended to bring the theatres of the road under the centralized control of New York. The results have been generally regarded as detrimental to dramatic art in America. The growth of the motion-picture business has modified this system, but has not in any essential respect changed it.

Under this system the actors are hired on an agreed weekly wage, but the contract is revocable on the part of the manager at any time, upon notice of a week or less. Sometimes the actor must contract to remain as long as the play continues to be acted, without receiving any reciprocal contract from the manager. (Probably such a contract is not valid in law, but it can usually be enforced by the custom of the theatrical business.) In nearly every case the actor gives his services gratis for the period of rehearsal, which usually lasts three to four weeks, but may be extended by the manager. Stars are sometimes retained under long-time contracts irrespective of the success or failure of the plays in which they appear. The weekly remuneration of actors of some experience and professional standing is from $100 to $500 a week. But stars may receive far more.

Prices for Theatre Seats. In England in Shakespeare's time prices varied from a penny to a shilling. In the early American theatres the prices were high—from three shillings for gallery seats to six shillings for seats in the boxes. Prices fell after the Revolution to 25 cents for gallery seats and $1 for box seats. This remained about the scale of prices until after the Civil War, when there was a steady increase. In 1870 first-class theatres in New York charged $1.50 for orchestra seats and from 35 to 50 cents for the top gallery. About 1886 a few New York theatres began charging $2 for the best seats in the orchestra and the first row in the first balcony, and gradually all first-class theatres made $2 the price of orchestra seats, with $1.50 and $1 for the balconies, and 50 cents for the gallery. For operatic performances $2 and $2.50 were the prices for orchestra seats in the New York Academy of Music until 1878, when the price was advanced by the English manager, Mapleson, to $3. A few years later, with the advent of Madame Patti, the price rose to $5 for orchestra seats, at which it has since remained. In Germany, with the exception of Berlin, the price of the best seats for either opera or drama seldom exceeds $1.50, and usually, for plays, is well beneath $1.

Law of Theatres. For legal purposes, a theatre is a house or building adapted and used for the purpose of dramatic performances. The courts differ in the various States as to what may be considered a dramatic performance, but generally almost any exhibition on the stage is included in this term. Thus, negro-minstrel shows and comic operas have been held to be theatrical performances within a law governing theatres. Laws regulating theatres are a constitutional exercise of the police power. Because of the public character of theatres, statutes have been enacted in most States prohibiting the discrimination against persons or citizens wishing to attend theatrical performances on the ground of race, creed, or color. This legislation is applicable also to hotels, barber shops, and all places of public amusement. Any discrimination for reasons other than race, creed, or color, however, does not come within the statutory prohibition, although the courts will scrutinize carefully the nominal reason given for withholding accommodation to see whether it be in fact a mere sham. The penalties for violation of this portion of the Civil Rights Act vary in the different States; generally the penalty is a fine recoverable by the person discriminated against and sometimes also punishment by imprisonment. In the absence of statute or in instances where the statutory prohibition is inapplicable a theatre ticket is regarded as a revocable license and theatrical managers may refuse to sell a ticket, or refuse to admit a person with a ticket without assigning any reason. Where proper notice is given to purchasers of tickets, the management may make it a condition that tickets shall not be transferable. This may be done by printing such conditions on the back of the tickets themselves and by notices posted at the theatre, or by giving actual notice to purchasers. Under such circumstances theatrical managers may refuse to honor tickets bought from speculators. (See TICKET.) The spectators may applaud or hiss the players in moderation, but must do so to express their spontaneous emotions, and not come with the intention of stopping or interfering with the performance, as in the latter case they may be ordered to leave the theatre and be forcibly removed if they refuse. In the Metcalfe and Woollcott cases in New York, the courts have sustained the owner's right to exclude critics who are supposed to be unfriendly, on the ground that they come not as spectators but in order to conduct business on the theatre premises.

The rapid increase of moving-picture theatres has caused practically every State to adopt stringent fire regulations and also regulations as to the admission of minors. Such regulations are a legal exercise of the police power and are usually enforced by a revocation of license. While the municipality has the licensing and regulating power, it has been held that only the State has power to make disobedience to such rules a crime, as in the case of violation of the Sabbath. In most States there is no legal and compulsory form of censorship, but in Ohio, Kansas, and a few other States statutes have been passed making censorship by a duly appointed board of censors necessary before the production of the film. This legislation has recently been upheld in the Supreme Court of the United States.

Construction. The larger theatres in Europe and a few of those in the United States, e.g., the Century in New York, are isolated buildings of monumental design, usually in Europe erected by the city or state. In interior arrangement and design, European theatres, though sumptuously decorated, are often inferior in comfort and convenience to the more recent American theatres, in which special attention is given to the seating, the heating, ventilation, and exits and to fireproof construction and safety from accident. Most American theatres are, however, built on inside lots or at the corners of street blocks, hemmed in by other buildings and with little external beauty of architecture. The largest theatre in Europe is the La Scala at Milan, seating about 3500; the largest in America is the Hippodrome in New York, seating over 5000, and designed for spectacular entertainments rather than for legitimate drama. The acoustics of theatres constitute a difficult and complex problem of great importance. See ACOUSTICS; OPERA HOUSE.

The modern theatre is divided into two or three parts, kept distinct in the structural scheme. First, there is the stage, with all necessary dressing rooms and mechanical equipment for the production of the play, together with space at each side and above for the storing of scenery, etc. Next there is the auditorium with its corridors, lounging rooms, etc. Finally, there is the outer lobby with its approaches.

This is often made a part of the auditorium structure. There are several modern types of theatre differing from the traditional type based on the Italian opera house, which has its balconies in horseshoe shape and its seats generally in curved rows. Modern practice in theatre building tends to make both the balconies and the rows on the ground floor straight. The larger opera houses, which seat upward of 3000, may have as many as five distinct balconies, including those composed of boxes. But the normal theatre for the spoken drama usually has a capacity between 1100 and 1500. A distinct type of playhouse, however, which has recently come into vogue, is the little theatre, which may have a capacity as small as 99, and rarely goes above 400. This is a direct result of the intimate and lifelike character of many modern plays which demand the most accurate attention. Recently, too, the large outdoor theatre, modeled on the Greek, has come into fashion.

Auditorium.—In the auditorium, the modern theatre has been strongly influenced by German methods. In addition to making straight rows, modern theatre architects incline to a steeply pitched floor, sometimes so much as to give the spectators of each row a clear view over the heads of those sitting in front. This type of auditorium is known as the amphitheatre, without implying a semicircular plan. Modern custom also tends to the elimination of boxes and loges, or to placing them at the rear. The galleries must of course be more steeply pitched than the ground floor. In the matter of decoration, too, modern taste follows the German. The ornate quality which is to be found in the Italian opera house is giving place to straight and bare walls, with a simple and harmonious color scheme. The science of acoustics has also made strides in recent years, although it is still in its beginnings. Experience has proved that the best acoustical results are obtained when draperies and all textile accoutrements are reduced to a minimum.

Stage.—The stage is primarily nothing but a box with a curtained opening, placed at one end of the auditorium. But the recent advance in the art of theatrical production, stimulated by scientific discovery, has made it the most elaborate part of the theatre. Normally the stage opening, or proscenium, is from 28 to 35 feet wide and from 15 to 22 feet high. The depth is usually from 20 to 35 feet, although it is frequently, in small theatres, as slight as 10 feet.

The dimensions of the whole stage structure are highly various. In the older theatre it was necessary that the total height be twice as great as that of the proscenium, in order to permit the raising of all scenery without rolling it. But with the increasing use of the set scene this condition is no longer indispensable. However, the modern trend is to increase the dimensions of the stage section greatly in all directions. The total width should be at least twice that of the proscenium, the depth should be at least 35 feet, the height should be generous and is frequently three times what is absolutely necessary. Whereas the stage section used to be a mere appendage of the auditorium, it is now the largest and most complicated part of the theatre.

The equipment of the stage may be simple or complex. In addition to the apparatus for raising and lowering the curtain, there is usually an elaborate equipment of ropes and pulleys in the flies above for raising and lowering the scenery. This apparatus is called the gridiron. The old equipment of grooves or slots in the wings or side spaces for the placing of masks or side pieces of scenery has become needless with the perfecting of the set scene. The stage itself is no longer steeply pitched, as formerly. Usually in the back there is a curved or semicircular cyclorama, painted white or sky-blue, for use in outdoor scenes. This is ordinarily made of canvas which can be rolled up on a cylinder. But it is sometimes constructed of solid plaster, and may be domed out towards the front. In one or two European theatres this dome cyclorama can be raised by machinery so as to be taken out of the actors' way. In some European theatres the stage is constructed in three lateral sections, which can be raised or lowered independently. There is often a set of trap doors in the stage with apparatus for lifting persons from below. In general, however, the permanent equipment of the stage has become much more simple than formerly. On the other hand the mechanism which may be used for special purposes is much more varied and complex.

The demand for elaborate scenery and for rapidity of scene shifting has created a number of special types of stage designed to conquer one or another of the difficulties which hamper the producer. Of these one of the best is the revolving stage used at the Deutsches Theater in Berlin. This is a circular platform which revolves upon a shaft deeply set in concrete. It is about 45 feet in diameter and is capable of receiving five or more complete sets, any one of which can be brought before the proscenium (and hence into view of the audience) by the revolution of the stage. The scene is not, however, limited to the dimensions of the revolving platform, but may be supplemented upon a surrounding stationary stage. Another type is the sliding stage, which is in reality a stage of double width which may be moved laterally so that half of it is completely concealed in the wings on either side; while the play is proceeding on one half of this platform, the setting for the following scene is being set up on the other. In some theatres the scenery is set upon small wagons, which can be rolled on to the stage in a few seconds and placed in their proper positions. In general, all scenes are set, and the painted drop or hanging canvas has little place in the modern theatre. Scene building has become a highly specialized business, and demands great ingenuity and expertness. Often realism demands the use of wooden structure of the most solid sort. On the other hand, the scene designers of recent times have taken great freedom in the art of suggesting (rather than depicting) reality by simple and conventionalized means.

Lighting.—The stage is usually lighted by incandescent bulbs placed just within the proscenium arch in the front, those below being called footlights and those above, border lights. These are in white and two or three colors, so wired that any set may be turned on and off independently of the others. Their intensity may be raised or lowered gradually at will by means of dimmers. To supplement them is a set of arc lamps called spot lights, which are movable and are usually operated from the wings, so as to cast a strong light on a certain spot or to eliminate shadows cast by the front lights. A more powerful spot light, often a calcium lamp, may be placed in the gallery to throw a special illumination upon one or more of the characters as they move about the stage. But lighting methods, in recent years, have undergone much change and experimentation, especially in Germany. The "Fortuny system" and related methods throw upon the stage an indirect light reflected from bands of silk or plaster surfaces. Subtle gradations of color can be obtained by the mixing of the primary hues under this method. In some theatres it is the practice to illuminate the stage by means of arc lamps placed in the first balcony, thus eliminating the unreal lighting from beneath that exists under the footlight system. At the present time producers are experimenting with many different systems and types of lamp.

Production. The process of theatrical production consists of assembling and rehearsing the actors, of providing suitable scenery, and of harmonizing all the separate elements into an artistic whole. In the best theatres all this work is directed by one man through his subordinates. Modern practice has divided stage production into several distinct types. The realistic type seeks to make all details accord as accurately as possible with the reality of everyday life. What is loosely called the artistic type seeks to provide, by more or less conventional means, effects of decorative beauty for the eye and ear, without strict regard to reality. Of this latter type there are many varieties. Some designers seek flat and picturesque effects according to the laws of the easel painter. Some seek depth and atmospheric quality by means of perspective and lighting. Others seek an arrangement, either with color or design or both, that shall subtly symbolize the mood of the scene. Often plays are produced in a highly simplified fashion imitated from the Elizabethan, in which crude scenery merely suggests the locale and no pains are taken with realistic appropriateness. All these methods make use of deliberate and conventional simplification for the sake of a definite artistic effect. The style of the acting must also accord with the style of the scenery, and vice versa; in the realistic manner the actors must play with full regard for the probabilities of the situation; in the artistic they must keep in mind the decorative effect of speech, gesture, intonation, etc.

In solving all these problems producers have been obliged to call to an unprecedented extent upon the workers in the various special arts, and carefully to mold their contributions to the desired theatric effect. As a result, the theatre has become a rich and flexible artistic instrument, surpassing all others in variety and potential power.

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THÉÂTRE ANTOINE. See Théâtre Libre.

THÉÂTRE DES ITALIENS, tā'ā'tr' dā zē'tā'lyăN' (Fr., theatre of the Italians). A former theatre of Paris from which the Boulevard des Italiens derives its name.

THÉÂTRE FRANÇAIS, frăN'sā'. The French national theatre. See Comédie Française.

THÉÂTRE LIBRE, lē'br' (Fr., free theatre). The name of a dramatic enterprise founded in 1887 by André Antoine, then a young Parisian clerk. With some fellow amateurs of the Gaulois Club he arranged the production (March 30, 1887) of four new one-act plays at the Elysée des Beaux-Arts at Montmartre, and in the course of the year formed the association of the Théâtre Libre, to be conducted upon the following principles: the season to consist of eight different representations, one each month from October to June; no tickets to be sold to the public; the enterprise to be supported by subscribers who with invited guests should form the only audience. The design was to give young authors a chance to try their strength; and also, for art's sake, to produce plays which for any reason, political or moral, might be forbidden by the censorship if undertaken at a public theatre. In an artistic way the Théâtre Libre won success, though it excited much debate from the first. Its founder aimed to do away with all conventionality and to attain a degree of realism often thought out of the question upon the stage. In its first eight years about 150 writers contributed works for its performances, and a considerable proportion of these previously unknown pieces were afterward accepted and brought out by other theatres. At the same time such famous writers as Zola, the Goncourts, Mendès, Bergerat, Ibsen, and Tolstoy also found presentation here. Financially, however, M. Antoine found his difficulties accumulating, and in 1894 he accepted a position as an actor at the Gymnase Theatre. For a short time he was codirector of the Odéon (1896); then he resumed the direction of the Théâtre Libre, for several years located in the Salle des Menus-Plaisirs and known since 1897 as the Théâtre Antoine. To this the general public is admitted in the usual way, though subscribers still retain their special privilege at eight representations a year. The idea of the Théâtre Libre has been copied in other countries. In 1906 M. Antoine returned to the Odéon.

THEA'TRUM EU'ROPÆ'UM (Lat., survey of Europe). A chronicle of events which appeared in 21 volumes at Frankfort-on-the-Main between 1616 and 1718. The work was in part the forerunner of political journals.

THEBAINE. See Alkaloids.

THEBAÏS, thē'bā-ĭs *or* thē-bā'ĭs (Lat., from Gk. Θηβαΐς). 1. The territory of Thebes, in Egypt. In later times the name was applied by the ancients to Upper Egypt. 2. An ancient Greek epic giving in 7000 verses the story of the house of Labdacus and the attack of the seven chieftains on Thebes. 3. A dull and long-drawn work by P. Papinius Statius, dedicated to Domitian. It contains in 12 books the story of the contests of Eteocles and Polynices.

THE'BAN CYCLE. The name given to a series of ancient Greek epics treating the legends of Thebes. It includes the *Thebaïs* (q.v.); the *Epigoni*, a poem of about 7000 lines, telling of the capture of the city by the descendants of the heroes of the *Thebaïs;* and the *Œdipodeia*, attributed to Cinæthon, a Lacedæmonian, containing about 6000 lines and giving the story of Œdipus.

THEBAN LEGION. See Legion, Theban.

THEBES, thēbz (Lat. *Thebæ*, from Gk. Θῆβαι). A celebrated city of ancient Egypt, situated on both sides of the Nile in about lat. 25° 50′ N. (Map: Egypt, C 2). Its old Egyptian name was *Wēset*, but in later times it was also called *Nu*(*t*) *Amen*, "the city of Ammon," *Nu*(*t*) *'o*, "the great city," or simply *Nu*(*t*), "the city" (*urbs*); in the Old Testament it is called *No* or *No Amon*, and in the Assyrian inscriptions its name appears as *Nî'*. By the Greeks, who identified the god Ammon with Zeus, it was sometimes called Diospolis, "the city of Zeus," and it was specially designated as "Great Diospolis" to distinguish it from "Lesser Diospolis," the modern Hon. The origin of the more usual Greek name Θῆβαι is obscure. Thebes was the capital of the fourth nome of Upper Egypt, and was a very ancient city, but did not rise to importance until the time of the eleventh dynasty, which was of Theban origin. Under this and the following dynasty the city was the capital of Egypt, and some of its oldest temple buildings date from this period.

Its real greatness, however, begins with the expulsion of the Hyksos invaders by the Theban princes, who united the whole land under their sway (eighteenth dynasty), and adorned their city with temples and palaces of unprecedented magnificence. The kings of the nineteenth and twentieth dynasties added to the work of their predecessors, and for centuries Thebes was the chief residence of the Egyptian Pharaohs and far surpassed all other cities of the land in wealth and splendor. The persecution of the worship of Ammon by the heretic King Amenophis IV (q.v.) and the temporary removal of the seat of government to Tel el Amarna affected Thebes but little. Seti I and especially Rameses II (c.1340–1273 B.C.) restored the desecrated sanctuaries and lavished enormous wealth upon the Theban temples. Under the twenty-first dynasty, however, Thebes ceased to be the capital of Egypt, and from this time gradually declined in importance. In the seventh century B.C. it was again the seat of government, for a time, under the twenty-fifth or Ethiopian dynasty, but when the capital was removed to Sais (q.v.) by the following dynasty (twenty-sixth), it began a new period of decline. Its temples were repaired and new buildings were erected by later monarchs, especially by the Ptolemies, but, overshadowed by the rise of new cities, it gradually sank to the position of an insignificant provincial town. Its great temples sustained serious injuries in the course of various revolts against the Ptolemies, and were further ruined by an earthquake in 27 B.C. In the time of the geographer Strabo (24 B.C.) Thebes was a ruined city, as at present, its site being occupied merely by a few scattered villages.

The city proper lay upon the east bank of the river between the great temples now represented by the ruins of Luxor (q.v.) and Karnak (q.v.); a little to the north was the suburb Ma'du, the modern Medamut, with a temple built by Amenophis II (eighteenth dynasty) and dedicated to the Theban war god Mont (q.v.). Additions were made to this temple by Seti I, Rameses II, and several of the Ptolemies, but it is now almost entirely destroyed. On the west side of the river were suburbs of considerable size, and Rameses III seems to have built his palace in the neighborhood of his memorial temple at Medinet Habu (q.v.), but in general this side of the river was occupied by the Theban necropolis, which extended to the Libyan range. It contained numerous temples, erected as memorials of the Egyptian kings and to these temples were attached dwellings for the priests, schools, granaries, stables, barracks, and other buildings. Nearer the hills were the dwellings of the artisans who were employed in the necropolis, stonemasons, builders, painters, sculptors, and especially embalmers. There were also inns for the entertainment of visitors, and many shops for the sale of funeral offerings and other objects. The necropolis, in fact, formed a great city. The principal memorial temples of the Theban necropolis, beginning at the north, were those of Kurnah (q.v.) and Deir el-Bahri (q.v.), the Ramesseum (q.v.), and that of Medinet Habu (q.v.). The rocky hills bordering on the plain of the necropolis are honeycombed with tombs. In a narrow valley to the north of Kurnah are the tombs of the kings, in which were buried the monarchs of dynasties XVIII–XX. Each of these tombs contains a number of galleries and chambers whose walls are covered with paintings and religious texts. Here, next to the tomb of Rameses IX, Theodore H. Davis discovered in January, 1907, the tomb of Teia, the mother of the heretic King Amenophis IV. The hatred which this king had aroused by his attempts to reform the state religion is shown by the fact that the tomb of his mother was opened after his death to erase every trace of his abominated name. The queen's mummy even had been turned over to erase the name of Akhen-Aten incised on a sheet of gold beneath it. The tomb presented the same lavish display of gold which was found in the tomb of the queen's parents, Tua and Yua, also found by Mr. Davis. Instead of the usual sarcophagus the coffin was sheltered by a great catafalque (torn to pieces by the invaders of the tomb) plated heavily inside and out with gold. The coffin, too, was completely covered with a frame of gold inlaid with lapis lazuli, carnelian, and green glass. The mummy, as well, was entirely wrapped in a sheath of gold. The canopic jars offer considerable interest in the four portrait heads of the queen which replace those of the usual gods' heads. Near Kom el-Hetan, between Medinet Habu and the Ramesseum is the famous "vocal Memnon" (see MEMNON). It was in no way distinguished from other colossi. The chief deities worshiped at Thebes were the great god Ammon (q.v.), his spouse Mut (q.v.), and their child Chons (q.v.).

Consult: Sir J. G. Wilkinson, *Topography of Thebes* (London, 1835); Karl Lepsius, *Denkmäler aus Aegypten und Aethiopen* (Berlin, 1850–59); A. E. Mariette, *Monuments of Upper Egypt* (London, 1877); E. H. Naville, *Deir El-Bahari* (ib., 1894–1906); N. de G. Davies, "Five Theban Tombs," in Archæological Survey of Egypt, *Memoir*, 21 (ib., 1913). For recent excavations at Deir El-Bahari see *Bulletin of the Metropolitan Museum of Art* (New York, 1914).

THEBES (Gk. Θῆβαι, *Thebai*). The principal city of Bœotia, in ancient Greece, situated in the southeastern part of the country, on the northern slope of a ridge which separates the valley of the Asopus from the plain to the north (Map: Greece, Ancient, C 2). The Acropolis or Cadmea, now occupied by the little town of Thiva or Phiva, lay on the high ground between the Ismenus and Dirce. At its greatest extent the ancient city seems to have extended beyond both streams. According to legend, Cadmus (q.v.) was the founder of the city—hence the Acropolis was known as the Cadmea. The city played a prominent part in the stories of the heroic age, the series of epics (see THEBAN CYCLE) vying in interest with those which gathered about Troy. For these stories, see ŒDIPUS; ANTIGONE; ETEOCLES AND POLYNICES; CREON; AMPHION; DIRCE. After the Bœotian invasion Thebes seems gradually to have secured the leading place in the Bœotian league, reducing finally the rival city of Orchomenus (q.v.). Tradition told of the code of laws drawn up for the city in the eighth century B.C. by the Corinthian Philolaus. It is not till near the end of the sixth century B.C. that we reach a purely historical period—the earliest well-attested event being the dispute between Thebes and Platæa (q.v.), as a result of which the latter city placed itself under Athenian protection, and the former became involved in an unsuccessful war. During the Persian invasion under Xerxes Thebes sided with the invaders, and fought against the confederated Greeks at Platæa (479 B.C.). This conduct greatly weakened for a time the prestige of Thebes, and almost cost her the headship of the Bœotian league. After the battle of Coronea (447 B.C.), however, the tendency to revolt was checked, and from this time Thebes was almost continuously the recognized leader in Bœotia. In the Peloponnesian War Thebes sided with Sparta, and at its close was eager for the destruction of Athens. But the policy of victorious Sparta soon aroused distrust, and Thebes gave a friendly welcome and shelter to those Athenians whom the oppression of the Thirty

Tyrants (q.v.) compelled to abandon their city. It was from Thebes that Thrasybulus and his band started on their famous expedition for the deliverance of Athens, accompanied by a body of Theban citizens. During the following years the Thebans completely changed their policy towards Sparta, and in the Corinthian War were among the bitterest enemies of their old ally. The Peace of Antalcidas (q.v.) (387 B.C.), as interpreted by Sparta, broke up the Bœotian league, and led to new disputes, culminating in the treacherous seizure of the Cadmea by the Spartans (382 B.C.). The expulsion of this garrison by Pelopidas (q.v.) and his associates (379 B.C.) led to renewed hostilities, which culminated in the battle of Leuctra (371 B.C.), where Epaminondas (q.v.) crushed the power of Sparta outside the Peloponnesus. Before his death at Mantinea in 362 B.C., Epaminondas had secured for Thebes the supremacy in Greece, though Athens was estranged and even openly hostile. Thebes, however, did not long hold the position thus gained. The quarrel with Athens prevented any union against the growing power of Macedon, until the seizure of Elatea (338 B.C.) furnished an opportunity for Demosthenes (q.v.) to secure by his eloquence a union for which he had long striven. The effort came too late, and in the same year the battle of Chæronea (q.v.) crushed the liberties of Greece.

After the death of Philip II, of Macedon, father of Alexander the Great, the Thebans made a fierce but unsuccessful effort to regain their freedom. Their city was taken by Alexander, who leveled it to the ground, sparing, it is said, only the house of the poet Pindar, and sold the entire surviving population into slavery (335 B.C.). For 20 years the city remained in utter desolation, but in 315 B.C. it was rebuilt by Cassander (q.v.), who gathered into it all the Thebans he could find in Greece. It now had a circuit of about five miles, and seems to have prospered. It suffered at the hands of Mummius (146 B.C.) and was severely punished by Sulla for siding with Mithridates. After this it steadily declined, and Pausanias found only the Cadmea inhabited, and the lower city in ruins. It revived under the later Roman Empire, as it was a safer residence than the exposed coast cities. During the eleventh and twelfth centuries it was the seat of a considerable population engaged in the manufacture of silk, and yielded a rich booty to Norman plunderers in 1146 A.D. Under the Turks it again declined, and even now is only a country town with a population of about 3500. The course of the town walls can be traced in some places, and deep digging has brought to light some remains, but in general there are but few vestiges of the ancient city left. Consult: M. Müller, *Geschichte Thebens* (Leipzig, 1879); E. von Stern, *Geschichte der spartanischen und thebanischen Hegemonie* (Dorpat, 1884); E. Fabricius, *Theben* (Freiburg, 1890); K. Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909).

THEBES, Saint Paul of. See Paul of Thebes, Saint.

THE DALLES, dălz. A city and the county seat of Wasco Co., Oreg., 88 miles east of Portland, on the Columbia River, the Oregon-Washington Railroad and Navigation Company and the Great Southern railroads, the Dalles-Celilo Canal, and on several steamship lines (Map: Oregon, D 2). Noteworthy features are the United States Land Office, county fair grounds, Chautauqua, Carnegie library, city hall, courthouse, Federal building, high school, and the city hospital. There are here railroad repair shops, a large flouring mill, lumber yards, salmon and fruit canneries, a wool scouring plant, planing mills, creamery, machine shops, and a box factory. Pop., 1900, 3542; 1910, 4880.

THÉDENAT, tā'de-nä', Henri (1844–). A French archæologist, born in Paris. He studied in the Ecole Pratique des Hautes-Etudes at the Sorbonne, devoting himself especially to epigraphy. His publications, in collaboration with Héron de Villefosse, include *Les cachets d'oculistes romains* (1882) and *Inscriptions romaines de Fréjus* (1885). He also wrote *Le Forum romain et les Forums impérieux* (4th ed., 1914) and *Une carrière universitaire, Jean-Félix Nourrisson* (1901).

THEFT. See Larceny.

THEGE-KONKOLY, Nikolaus. See Konkoly, Nikolaus Thege von.

THEGN, thān. See Thane.

THEIL, François Jean Gabriel La Porte du. See La Porte du Theil, F. J. G.

THEINE, thē'ĭn *or* thē'ēn. See Caffeine.

THEINER, tī'nēr, Augustin (1804–74). A German Roman Catholic historian and canonist. He was born at Breslau and educated there and at Halle, where he took his degree as Doctor of Law in 1829. His intercourse in Paris with Lamennais (q.v.) seems to have disturbed his religious views, but he was reconciled with the Church at Rome in 1833, and became a teacher in the College of the Propaganda. After his ordination to the priesthood, he entered the Congregation of the Oratory, and published several historical and critical works. In 1855 he was placed in charge of the Vatican archives. In 1870 he was removed from the position of archivist, apparently in consequence of the charge that he had supplied documents with which to combat the theory of the infallibility of the Pope. His most important work was the new edition of the *Annals* of Baronius and his continuators, with three supplementary volumes. Important also are the collections of documents on the ecclesiastical history of various countries and of the Council of Trent. In his *Geschichte des Pontificates Clemens XIV* (1853), he attacked the Jesuits and roused fresh suspicions of his loyalty to the Church, which were confirmed by his *Histoire des deux concordats de la république française en 1801 et 1803* (1868) and by his friendly intercourse with the German Old Catholic leaders. He died of apoplexy at Cività Vecchia. Consult Gisiger, *P. Theiner und die Jesuiten* (Mannheim, 1875), and Brück, *Geschichte der katholischen Kirche in Deutschland* (Mainz, 1896).

THE'ISM (from Gk. *θεός*, *theos*, god). The theory which assumes a living relation between God and His creatures, though it does not necessarily define it. The term came to be used in England in the seventeenth century in contrast with deism (q.v.), as expressing a more vital and personal relation of God to His creation than the term "deism" then served to denote. In western thought the discussion of the relation of God to the world arose with the Greeks. In the philosophic theism of Socrates, which was a reply to the irreligion of the Sophists, we find a clear conception of a divine personality and an attempt to prove its existence. Socrates makes use of the doctrine of final causes for this purpose, maintaining, against the Sophistic materialism, that the universe is the product of benevolent moral will (*Phædo*, 96, 199); that this will holds personal relations with all his creatures, and seeks to bring the highest good to all. Plato added little to the fundamental conception except to develop it by means of his doctrine of the Idea (ἰδέα, εἶδος). The absolute Idea is the Good, i.e., God. In the *Republic* (509 b.) we accordingly read: "All intelligible beings derive their being and their essence from the good." To this thesis he adduces four proofs, all bearing on Socrates' idea of final cause. 1. From the notion of efficient cause. All things proceed from some cause, and the cause must be adequate to produce what exists. (*Sophist*, 205 b.) 2. From the ideal nature of the cause. If there be a universe of real things, as no one can doubt, it can proceed only from an ideally perfect cause, i.e., from God. (*Philebus*, 30.) 3. From the idea of cause as motion. All motion implies a self-mover, i.e, an adequate originating cause for the motion and change. (*Laws*, x.) 4. From the finality of cause. All things seek their end. The end must be moral, and therefore transcendent. In other words, the universe must at last prove itself to be a revelation of the Good, i.e., God. This is the heart of the Platonic theism. "Let me tell you, then, why the Creator made this world of generation. He was good, and the good can never have any jealousy of anything. And being free from jealousy, He desired that all things should be as like Himself as they could be." (*Tim.* 29.)

Aristotle's argument is the same as Plato's, but deeper in its empirical developments. He rises, synthetically, through nature, to his proof of the divine existence. In the eighth book of his *Physics* he gives us what he calls his proof of the First Mover. Everything that is in motion is moved either by something else or by itself. If the former be the case, we are obliged to follow up the series of causes until we arrive at the idea of a self-mover, i.e., an immovable cause having its end in itself.

Augustine, the most eminent of the early Christian thinkers, adopted the Platonic theism, seeking to combine it with the Christian views. He accepted substantially all the principal proofs of God's existence and His providential government as these had been prepared in Greek thought; but there were points where he added to previous thinking. The Greeks had put a gulf between God and the world. Augustine completed this by declaring that God made the world out of nothing, and without the aid of intermediate agents. Second, Augustine taught that God creates out of His mere goodness and bounty, not because He has need of anything; so that in creating He adds nothing to His nature. (*Conf.* xiii. iv.) This view struck at the Stoic pantheism, at the Oriental theories of emanation, and at the fundamental weakness of the Platonic theism, the failure to define the nature of the relation between God and the finite world.

The various other proofs of the existence of God given in the Middle Ages pursue two methods, one *a priori*, the other *a posteriori*. That is, one starts in Platonic fashion with the idea of a perfect being and infers its existence from this idea; the other argues, after Aristotle, from the evidences of order and perfection in the world to the idea of a perfect being who is the author of them. Anselm is an early and prominent representative of both this and the *a priori* or ontological argument, which assumes that God is a being of such a nature that it is impossible to conceive any greater. The defect of this argument, as Gaunilo pointed out, consists in arguing from existence in thought to existence in fact. From the former, of course, we can logically infer nothing but an ideal thought existence.

Other theistic proofs during the Middle Ages were concerned with the course of nature and history. Thus Duns Scotus declared that the impossibility of conceiving an infinite chain of natural cases necessarily carried the mind to the idea of a great first cause adequate to the production and preservation of the world. Aquinas also (*Summa* I., qu. 2) reaches the same conclusion, *a contingentia mundi*, reproducing Aristotle's proofs almost word for word. The contemplation of final causes, though not extensively meditated upon, led to very similar logical results from the cosmological point of view; for mediæval thinkers were fond of dwelling on the fact of the imperfection of the physical and of inferring therefrom the existence of a perfect being in whose spiritual essence the soul could find the ground of the Christian faith.

In modern times philosophical meanings have largely supplanted the theological. Thus Descartes, the most important modern thinker on this subject, developed his theism only after sweeping aside all presuppositions derived from a supernatural source or from the symbols of the Church. Starting with the bare fact of thought (*cogito, ergo sum*), he argues that there must be an adequate cause for the thought of God in the mind. By this thought Descartes says that he means "a substance infinite, eternal, immutable, independent, all-knowing, all-powerful; by which I myself and every other thing have been produced." (*Med.* iii.) Now this thought cannot be a mere negation; for it has reality. Nor can it have arisen by adding many ideas together; for it is simple. Could it have arisen as a result of my growing intelligence? No; because the idea does not admit of growth: God is infinite always and does not admit of more or less. Hence the idea must have a divine origin. A second proof may be stated thus. We need this idea in order to explain to us the immediate existence and continuance of the universe. God is not only needed as a Creator, but much more as a Preserver. The existence now of a universe involves the self-existence of its absolute cause. As a third proof Descartes revived Anselm's so-called ontological argument, i.e., the argument from the idea of a most perfect being to its existence. Reality, in his view, is as much a part of the idea of a perfect being as the angles of a triangle are of the essence of our idea of a triangle.

Kant, in the third part of his *Dialectic*, criticizes this argument of Descartes. He does not, indeed, deny the fact that we have the idea of a perfect being, but he doubts if from the idea we have any right to infer its real existence, since it is possible for us to have an idea (e.g., of a centaur) that does not correspond to any object. And inasmuch as all possible proofs of the existence of God are reducible to this one, the ontological, Kant considers that all the arguments of Descartes and of the mediæval thinkers failed to establish their point. Accordingly he proposed a new and infallible proof, the so-called practical or moral argument for the existence of God, which is as follows. We have the notion of a moral law; conscience responds to the categorical moral imperative. Universal experience proves that happiness and virtue involve each other and cannot be separated. Now, said Kant, for this conviction there is needed a cause, supreme and infinite; a cause capable of clinching this relation between happiness and virtue to all eternity; a cause which will secure the triumph of justice as against the moral inequalities of the present life. This moral cause we call, by faith, God.

Hegel disagreed with Kant's conclusions, and sought to revive the ontological argument of Anselm and Descartes, in a new form, contending that the idea of a perfect being was an expression of the nature of all thought and all reality. For him thought and reality are the same. We can never get "beyond" thought. To put a barrier, as Kant did, between thought and thing is, for Hegel, to cease to think. Modern thought tends to emphasize the personality of God, as the ground of human personality. It also lays great emphasis on the immanence of God, both in man and in the natural world, yet not with deistic or pantheistic implications.

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THEISS, tīs (Hung. *Tisza*, Lat. *Tissus*). The largest tributary of the Danube, and, next to the latter, the principal river of Hungary (Map: Hungary, G 3). It rises in the Carpathian Mountains and flows first westward, then south, the lower half of its course being parallel with that of the Danube below Budapest. After a tortuous course of 800 miles it joins the Danube about 30 miles above Belgrade. In its upper course through the narrow mountain passes it is rapid and clear, but in the great plain of central Hungary it is very sluggish; from Szegedin to the end of the Theiss—150 miles—the river has a fall of but 15 feet, so that any rising of the Danube drives back the Theiss and causes disastrous inundations. Large sums have been expended in attempts to regulate the flow of the river and drain the marshes. The Theiss is navigable to Tokay, but steamboats ascend generally only to Szegedin at the mouth of the Maros (q.v.), the chief tributary. From the lower course of the river a canal runs westward to the Danube. The Theiss is famous for its fish.

THELLUSSON (tĕl′lŭs-son, *or Fr. pron.*, tā′-lụ′sôɴ′) **ACT.** See PERPETUITY.

THEME (Lat. *thema*, from Gk. *θέμα*, thing laid down, deposit, prize, proposition, subject, from *τιθέναι*, *tithenai*, to set, place). In music, a term which is in a general sense synonymous with subject or motive (q.v.). Every composition is built up from themes which constitute the basic material. In a specific sense, the theme of a fugue is the subject (dux). In variations the theme is a complete musical idea, generally of periodic structure. It is always played in its entirety before the variations begin. See LEITMOTIV; SONATA; SYMPHONY.

THE′MIS (Lat., from Gk. *Θέμις*, justice personified, from *τιθέναι*, *tithenai*, to set, place). In Greek mythology, the goddess and guardian of the eternal laws, established by the gods. In the Hesiodic theogony she is called the daughter of Uranus and Gæa (heaven and earth), the wife of Zeus, and, by him, mother of the Horæ (Hours) and Mœræ (Fates). In Æschylus she is identified with Gæa, and called mother of Prometheus. As guardian of the due order of things, she was also possessed of prophecy. The popular conceptions do not seem to have distinguished sharply between Themis and Gæa, and at Athens we hear of *Gē Themis* as a single divinity. At Rhamnus she was honored in the Temple of Nemesis, and here has been found a fine statue by Chairestratos of Rhamnus, an artist of the early third century B.C. Consult: Otto Gruppe, *Griechische Mythologie und Religionsgeschichte* (2 vols., Munich, 1906); Rudolf Hirzel, *Themis, Dike, und Verwandtes* (Leipzig, 1907); J. E. Harrison, *Themis: A Study of the Social Origins of Greek Religion* (Cambridge, 1912).

THEMIS′TIUS (Lat., from Gk. *Θεμίστιος*) (?–c.388 A.D.). A Greek rhetorician of Paphlagonia, surnamed Euphrades (eloquent), who lived at Constantinople, as a teacher of philosophy and oratory. Though a pagan in religion, he was highly honored by several of the emperors for his nobility and learning. He was tutor to Arcadius, the son of Theodosius, who made him Prefect in 384. There are extant 34 of his speeches, which, though chiefly eulogies in compliment to various emperors, contain interesting allusions to contemporary history, and instructive quotations from the ancient philosophers; and some of his paraphrases of portions of Aristotle (the *Posterior Analytics*, the *Physics*, the *De Anima*, the *De Caelo*, and Book II of the *Metaphysics;* the last two are known only through Hebrew versions). The orations have been edited by Dindorf (Leipzig, 1832); the paraphrases as a whole by Spengel (ib., 1866).

THEMIS′TO (Lat., from Gk. *Θεμιστώ*). In Greek legend, the third wife of Athamas (q.v.). Her husband, on discovering that his former wife, Ino (q.v.), was still alive, sent for her, and Themisto in revenge planned to slay Ino's children. With this intention she directed a new slave to clothe her children in white and Ino's in black, but Ino, who was herself the slave in disguise, reversed the command, and Themisto killed her own children, whom she did not distinguish in the night.

THEMIS′TOCLES (Lat., from Gk. *Θεμιστοκλῆς*, *Themistoklēs*) (c.514–449 B.C.). An Athenian general and statesman, born about 514 B.C., the son of Neocles, an Athenian citizen of middling station and circumstances, and a Carian or Thracian woman. After the battle of Marathon (490 B.C.), when the first invasion of the Persians had been successfully resisted, Themistocles, with keen foresight, recognized that the final decision of the question of supremacy would come on the sea, and that the only way for the Greeks to be victorious was to have a large fleet. He aimed, therefore, at the development of a strong Athenian navy. To this end he persuaded the Athenians to devote the proceeds arising from the working of the silver mines at Laurion (q.v.), which it was intended to distribute among the citizens at large, to the construction of a strong fleet. He secured the passage of a law that a certain number of new triremes should be built every year. From the time of the expulsion of Aristides by ostracism (483 B.C.), Themistocles controlled the politics of Athens, and in 481 B.C. was made archon eponymus. When it was learned that Xerxes was preparing a powerful armament to invade Greece, and the Athenians had been told by the Delphian oracle to defend themselves with the "wooden wall," Themistocles interpreted this answer as referring to the ships of Athens. At the battle of Artemisium (480 B.C.) Themistocles, as commander of the Athenian fleet, which was the largest in Greece, consented to fight under the Spartan commander, Eurybiades, but it was only through the former's tact and adroit use of bribes that the Greek commanders were finally induced to make a stand in that place. This engagement was indecisive. In the same year, at Salamis (q.v.), was fought the battle which shattered the naval power of Xerxes. Here again Eurybiades was commander in chief, and here again it was owing to Themistocles alone that the Greeks were induced not to retreat to the Isthmus of Corinth, but to give battle in their present position. He threatened, if a separation were now made, that the Athenians would take their women and children and sail to Italy, there to found a new home. Finally, he precipitated the contest, by dispatching to Xerxes a secret message to the effect that, if the Persians wished to crush the Greek fleet, they should advance to the attack without delay, before the Greeks had an opportunity of fleeing. After the battle of Salamis Themistocles was the most important man in Greece. When the Persians had retreated from Greece and the Athenians undertook to restore their city, the Spartans, sending an embassy to Athens, urged the Athenians not to attempt to rebuild the fortifications. Then Themistocles, going on an embassy to Sparta, entertained the Spartans with his false professions, and kept the matter in abeyance till such time as the walls were sufficiently advanced to allow of their being defended. In 471 B.C. he was ostracized and retired to Argos; and finally, to escape being tried for treason, in which, according to some accounts, he was implicated by the correspondence of Pausanias (q.v.), he betook himself in 465 B.C. to the court of Artaxerxes, King of Persia; but, before he would see the King himself, he got permission to wait a year, during which he made himself master of the language and usages of the country. At the end of this time he managed to raise himself so high in the King's favor that, after the Persian fashion, the town of Magnesia was appointed to supply him with bread, Lampsacus with wine, and Myus with other provisions. He lived securely at Magnesia until his death in 449 B.C. Some authorities assert that he poisoned himself. A monument was erected to Themistocles in the market place of Magnesia, and it is said that his bones were secretly taken to Attica, and there burned. His life was written in ancient times by Plutarch and Cornelius Nepos. Consult: Wecklein, *Ueber Themistokles* (Munich, 1892); Bauer, *Themistokles* (Merseburg, 1881); and the standard histories of Greece.

THÉNARD, tā'när', LOUIS JACQUES (1777-1857). A French chemist, born at Nogent-sur-Seine. He was professor of chemistry at the Ecole Polytechnique, at the Collège de France, and at the University of Paris. From 1810 he was a member of the Institute. His original researches resulted in numerous important contributions to chemistry. He improved the methods of ultimate organic analysis; investigated the compound ethers or esters; discovered the peroxide of hydrogen, cobalt ultramarine (Thénard's blue), etc. He published *Traité élémentaire de chimie théorique et pratique* (4 vols., 1813), which passed through several editions, and, jointly with Gay-Lussac, two volumes of *Recherches physico-chimiques* (1811).

THE'OBALD I. King of Navarre. See THIBAUT I.

THEOBALD, thē'ô-bạld *or* tĭb'ald, LEWIS (1688-1744). A Shakespearean editor, born at Sittingbourne, in Kent. Though educated for the law, he early turned to literature. He wrote and adapted plays, and made translations from Sophocles, Aristophanes, and other Greek authors. In 1725 Pope published an edition of Shakespeare, work for which he was ill equipped. Theobald sharply reviewed it in a volume entitled *Shakespeare Restored* (1726). Pope retaliated by making Theobald the first hero of the *Dunciad* (1728). Early in 1734 Theobald brought out his own edition of Shakespeare in seven volumes. At the time of his death Theobald was at work on an edition of Beaumont and Fletcher, which appeared six years later. Theobald's original prose and verse is of little account, but as a textual critic he possessed rare insight. His one aim was to divine, in a corrupt passage, what Shakespeare wrote, and he made over 300 corrections, which have been generally adopted. Consult Collins, *Essays and Studies* (London, 1895). See POPE, ALEXANDER; DUNCIAD.

THE'OBRO'MA. See CACAO.

THE'OBRO'MINE (from Neo-Lat. *Theobroma*, from Gk. *θεός*, *theos*, god + *βρῶμα*, *brōma*, food), $C_7H_8N_4O_2$. An alkaloid chemically allied to uric acid and still more closely related to caffeine (theine). It is found in considerable quantities in cocoa and may be extracted from powdered cocoa beans with hot water; the resulting solution is freed from tannin and other impurities by precipitation with lead acetate; next, the solution is freed from lead by means of sulphureted hydrogen, and evaporated to dryness; the theobromine is, finally, extracted from the dry residue by boiling with alcohol. The theobromine may be obtained artificially from the lead salts of xanthine by the action of methyl-iodide. Theobromine is a white crystalline substance sparingly soluble in water and forming crystalline compounds with both acids and bases. Among its compounds may be mentioned theobromine-sodio-salicylate, a substance obtained by mixing sodium salicylate with sodium-theobromine, and used in medicine under the name of diuretin. Diuretin acts as a diuretic without having any action upon the heart. See ALKALOIDS.

THEOC'RITUS (Lat., from Gk. *Θεόκριτος*, *Theokritos*) (c.310-c.245 B.C.). The first and greatest of the Greek bucolic poets. The details of his life are not clearly known. He was commonly reckoned a Syracusan, although some have believed that Cos was his birthplace. In any case, he spent considerable time in that island and eastern Greece, where he was acquainted with the elegiac poet Philetas and the writer of epigrams Asclepiades, whom tradition makes his teachers, and also with the physician Nicias of Miletus and the poet Aratus (q.v.) of Soli. He spent some time at the court of Ptolemy Philadelphus in Alexandria and also at the court of Hiero II at Syracuse; but the exact dates for these periods cannot be determined, as the chronological order of his poems is uncertain. We have current under his name 31 poems and a number of epigrams. Of the longer poems 10 are bucolic, three are mimes in imitation of the mimes of Sophron and very similar to the recently discovered mimes, of Herondas, and the other poems are of varying subjects and character, while a few are spurious. Theocritus displayed marvelous power in uniting artistic and popular elements in his verse in a way which has never been equaled by his followers and imitators. His language is, for the most part, a modified Doric; two poems are in the literary Æolic. Though he lived in an artificial period, there is in his work a simplicity, a fidelity, and a love of nature that has given him universal fame. His dramatic and mimetic power was great, so that his peasants, shepherds, reapers, and fishermen have a real existence and are not merely literary creations. He was imitated by Bion and Moschus among the Greeks, and by Vergil most successfully among the Romans (in the *Eclogues*). Important editions are by Ahrens (2 vols., Leipzig, 1855), and especially by Ziegler (Tübingen, 1879). The most recent edition of the text is by U. von Wilamowitz-Moellendorf (Oxford, 1907). The best edition with commentary is by Fritzsche-Hiller (Leipzig, 1881). There are English editions by Kynaston (Oxford, 1892) and by Cholmeley (London, 1901); English translations in verse by Calverley (2d ed., Cambridge, 1869); by Andrew Lang (New York, 1880); A. S. Way (Cambridge, 1913); and in prose, by Metcalfe (Boston, 1906). There is a special lexicon to Theocritus by Rumpel (1879). Consult also: Legrand, *Étude sur Théocrite* (Paris, 1898); W. C. Wright, *A Short History of Greek Literature* (New York, 1907); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part i (5th ed., Munich, 1911).

THEODICY, thê-ŏd'ĭ-sĭ (from Gk. *θεός*, *theos*, god + *δίκη*, *dikē*, justice). The exposition of the theory of divine providence, and particularly the defense of the goodness and wisdom of God against objections drawn from the existence of pain and sin in the world. The problem is as old as human thinking; the name is modern and dates from the close of the seventeenth century. The first to consider the question in its entire scope was Leibnitz (q.v.) in his *Essais de théodicée* (1710). In England a long list of publications has appeared, principally in reply to the sensational school beginning with Hume and closing with J. S. Mill, who could scarcely maintain the existence of God, and saved His benevolence only at the expense of His omnipotence. In America, where Jonathan Edwards made contributions to the discussion in his famous *Freedom of the Will* (1754), and was followed by Bellamy, *Wisdom of God in the Permission of Sin* (1758); Hopkins, *Sin through the Divine Interposition an Advantage to the Universe* (1759); and many others, down to N. W. Taylor (q.v.), whose contribution to the subject may be condensed in the hypothesis that in the best moral system a benevolent God might not be able to prevent sin consistently with the maintenance of the system and the attainment of the highest results therefrom. He thus gave a place to the human will which no theologian of orthodox descent had previously given. Since the appearance of Hegel, the Christian idea of God has met with new objections, and theodicy has been enlarged to consider these, especially by Maret and Gratry in France. The appearance of pessimism in Germany gave a new turn to the argument, since it was no longer possible to assume as undisputed the principle of Leibnitz, that God has chosen the best possible world. And with the appearance of evolution and the Spencerian agnosticism, the argument has turned to the more fundamental matters; so that theodicy has almost disappeared as a distinct department of theology.

THEOD'OLITE (of uncertain etymology; perhaps from Gk. *θεᾶσθαι*, *theasthai*, to see + *ὁδός*, *hodos*, way + *λιτός*, *litos*, smooth, even; hardly from Gk. *θεᾶσθαι*, *theasthai*, to see + *δολιχός*, *dolichos*, long). An instrument used in surveying especially in geodetic work for the measurement of horizontal and vertical angles. It is larger than the transit and, having larger and more carefully graduated circles, is employed in measuring angles where the highest accuracy is demanded. In its main features it is similar to this instrument, but differs chiefly in that its telescope does not revolve completely or transit in its horizontal axis. See GEODESY; SURVEYING INSTRUMENTS.

THE'ODO'RA (c.508–548). A Byzantine Empress, wife of Justinian. She was the daughter of Acacius, the keeper of the wild beasts at the circus of Constantinople, and after his death was for a time a favorite on the stage and a famous courtesan. She fascinated Justinian, nephew of the Emperor Justin I, by her great beauty, and about 525 he married her. Thereafter she led an exemplary domestic life. In 527 Justinian became Emperor, and Theodora henceforth exerted a commanding influence upon public affairs. She was extremely cruel, and her numerous spies ferreted out all who were opposed to their royal mistress. At the time of the Nika Riot (532) she prevented Justinian from fleeing and brought about the suppression of the insurrection. Most of our information concerning Theodora is derived from Procopius' *Anecdota*. Consult: Antonin Débidour, *L'Impératrice Théodora* (Paris, 1885); C. E. Mallet, "The Empress Theodora," in the *English Historical Review*, vol. ii (London, 1886); Charles Diehl, *Justinien et la civilisation byzantine au sixième siècle* (Paris, 1901); id., *Théodora, impératrice de Byzance* (3d ed., ib., 1904); Edward Gibbon, *Decline and Fall of the Roman Empire*, edited by J. B. Bury, vols. iv and v (new ed., 1912).

THEODORA (?–867). Byzantine Empress. She was born in Paphlagonia and in 829 married the Emperor Theophilus (died 842), whom she succeeded in the government as Regent for her four-year-old son Michael III. While her husband had been a violent iconoclast, she was attached to the worship of images, and consequently expelled the iconoclasts from office and recalled the banished image worshipers. She also convoked the Constantinople Synod of 842 which restored the images to the churches, a triumph annually celebrated in the Greek church by the Sunday of Orthodoxy (the first Sunday in Lent). Her rule was on the whole wise, but some of her wars were unfortunate. When Michael came to the throne, in 856, he, influenced by his uncle Bardas, deprived his mother of her position and she died in a convent.

THEODORA. A member of the Roman nobility, who lived in the tenth century. She was very beautiful, of unknown parentage, wife of the consul Theophylact. She ruled Rome and controlled the papacy for a term of years, calling herself by the title of Senatrix. She was the mother of Marozia and Theodora II, who were equally licentious and unscrupulous. She placed several of her creatures on the papal chair, among whom John X may be specially mentioned. Consult Ferdinand Gregorovius, *History of the City of Rome during the Middle Ages*, translated by Annie Hamilton (London, 1895).

THEODORE, King of Abyssinia. See Abyssinia.

THEODORE I, King of Corsica. See Neuhof, Theodor von.

THE'ODORE OF MOP'SUES'TIA (c.350–428). The most noted biblical scholar and theologian of the school of Antioch. He was born in Antioch, was educated under the rhetorician Libanius, and studied theology with Diodorus. At the age of 32 he was made presbyter of the Antiochian church, and in 392 he became Bishop of Mopsuestia, a small town in Cilicia, about 40 miles from Tarsus. In fame and influence he surpassed all the other Christian teachers and writers of the East. His biblical scholarship seems almost modern. His commentaries have in many cases perished, but enough remains to show his historical spirit, and the simple, literal method of interpretation which characterized the school of Antioch, as against the mystical, allegorical method of Alexandria. Theodore expounded almost all the books of the Bible. He also wrote on the incarnation and various other theological topics. Soon after his death, charges of doctrinal error began to be brought against him, and his opinions were condemned by the Council of Ephesus (431), though his name was not mentioned. He had no doubt favored the Pelagians, and the fact that he had been the teacher of Nestorius was afterward remembered against him. Opposition to his theology continued and increased until the fifth general council (Constantinople, 553), when he was explicitly condemned, in connection with the "Three Chapter Controversy." Part of the remains of Theodore's works are printed in Migne, *Patrologia Græca*, vol. lxvi. The Latin version of his commentary on the minor Pauline Epistles has been edited by Swete (Cambridge, 1880–82), and the Syriac version of his commentary on John by Chabot (Paris, 1897). The best general account of Theodore in English is in *Smith's Dictionary of Christian Biography*, by Wace and Piercy (Boston, 1911). Consult also H. Kihn, *Theodore von Mopsuestia* (Freiburg, 1880); Bardenhewer, *Patrologie* (Eng. trans., St. Louis, 1908). For his theology, consult A. Harnack, *History of Dogma*, vols. iii, iv (Boston, 1898). See Chapters, The Three.

THEODORE OF TAR'SUS (c.602–690). Archbishop of Canterbury. He was born at Tarsus; studied at Athens; became a monk; early distinguished himself as a scholar and was familiar with Greek and Latin literature; was consecrated at Rome as Archbishop of Canterbury by Pope Vitalian and arrived at his see May 27, 669. He did a great work for the Church in England, which at the time of his coming had sunk to a low state. He divided his large dioceses into more manageable ones; appointed worthy bishops; promoted learning and clerical discipline; increased the monasteries; held progressive synods; and so left the Church a compact and enlightened body. His life is recorded in Bede, *Ecclesiastical History*. Consult G. F. Browne, *Theodore and Wilfrith* (London, 1897). See England, Church of.

THEOD'ORET (Gk. Θεοδώρητος, *Theodōrētos*) (c.393–457). A Greek Church historian and biblical scholar. He was born at Antioch, of Christian parents. Theodoret, with Theodore of Mopsuestia (q.v.), is to be classed with the Antiochian school, as opposed to the Alexandrian. He was rational rather than mystical in his theology, and historical rather than allegorical in his biblical interpretation. He entered the monastic life at Apamea, and was loth to leave his monastery when made Bishop of Cyrus in Syria (423). Theodoret achieved great success in winning back to orthodoxy the survivors of the ancient Marcionites (see Marcion), and in suppressing the use of Tatian's *Diatessaron*, a compilation of the Gospels which had long been current in Syria. (See Tatian.) His connection with the cause of Nestorius (q.v.), which began in his youth, continued until near the close of his life. He stoutly opposed Nestorius' condemnation at Ephesus (431) and denounced the famous Anathemas of Cyril, which had been launched against Nestorius shortly before. His own orthodoxy was seriously questioned, and the Robber Synod (449; see Ephesus, Councils of) deposed him from his see, but he was reinstated by the Council of Chalcedon, two years later. Under great pressure by the Council of Chalcedon, Theodoret was finally prevailed upon to anathematize Nestorius, but he did it with the utmost reluctance, and it is doubtful whether his real opinion was ever changed. About 200 of his letters survive, giving valuable information on the events of his age. Most important perhaps of all his works is the *Ecclesiastical History*, written in continuation of Eusebius and bringing the narrative down to 428. His *Works* have been several times edited, e.g., by Schultze (Halle, 1769–74), and Migne, *Patrologia Græca*, lxxx–lxxxiv. An English translation of the *History*, *Dialogues*, and selected *Letters*, with valuable prolegomena, is given in *The Nicene Fathers*, edited by Schaff and Wace, 2d series, vol. iii (New York, 1892). Consult: Harnack, *History of Dogma*, vol. iv (Boston, 1898); Schubert-Moeller, *Lehrbuch der Kirchengeschichte* (Tübingen, 1902); Bright, *Age of the Fathers* (London, 1903).

THEOD'ORIC I, King of the Visigoths (419–451). See Goths.

THEODORIC, thē-ŏd'ō-rĭk (Lat. *Theodoricus*), surnamed The Great (c.454–526). The founder of the Ostrogothic Kingdom in Italy. He was born on the banks of the Neusiedler See, in Pannonia. His father, Theodemir, was one of the three brothers who on the death of Attila (453 A.D.) freed their nation from the yoke of the Huns, and being the representatives of the royal line of the Amali, exercised a united sovereignty over it. In his eighth year Theodoric was sent as a hostage to the eastern Emperor and was trained in all kinds of athletic and martial exercises. He returned to his people about 471 and in 474 succeeded his father as head of the nation. In the previous year the Ostrogoths had obtained parts of Mœsia and Dacia, as settlements, from the Emperor Zeno. For the next 13 years Theodoric was frequently engaged in strife, sometimes against the Empire, sometimes in its service. In 484 he was made consul, in 486 he was granted the honor of a triumph. The Emperor, to free himself from Theodoric, gave him permission to invade Italy, and the warlike monarch began his march in 488, and arrived early in 489 on the frontiers of Italy. Odoacer (q.v.), King of Italy, the first of the Germanic rulers of that country, was forewarned and forearmed; a desperate battle was fought near Aquileia (August, 489), the result of which was to the advantage of the Ostrogoths. A second and more disastrous defeat was inflicted on Odoacer near Verona (September 30), after which he took refuge in Ravenna; but having again gathered a large force, he was totally routed on the banks of the Adda (August, 490), and again blockaded in Ravenna, while the whole of Italy was being subdued; and having at last surrendered, was treacherously murdered (March, 493). Theodoric now assumed the title of King of Italy, resisted the claim of suzerainty preferred by the Eastern Emperor, and with the exception of a victorious campaign against the Franks, to stop their assaults on the Visigothic dominions, the suppression of a rebellion in Spain against the infant monarch, his own grandson Amalric (during whose minority Theodoric administered also the government of the Visigothic Kingdom), and an expedition against the robber hordes of the Bulgarians, the whole of his long reign was devoted to the consolidation and development of his new kingdom. His followers received only one-third of the public lands; private property was legally secured to the rightful possessors. He made Ravenna his capital, occasionally, when his northern frontier was threatened, removing to Verona.

Theodoric showed no desire of further conquest; cultivated the friendship and esteem of the surrounding nations; ruled all classes of his subjects with irresistible authority, but with corresponding justice and moderation; zealously promoted agriculture and commerce; and, himself an Arian, exhibited a tolerance of all other sects which was then almost unknown. The government was administered by Romans on Roman lines; separate codes of law were used for Romans and Goths. Theodoric left no son; but his daughter, Amalasuntha (q.v.), succeeded him as regent for her son, Athalaric. Theodoric became a hero of many Germanic legends under the name of Dietrich of Bern. Among the men who held office under Theodoric were Boëthius and Cassidorus. The former, who had incurred the suspicions of the monarch towards the close of his reign, was unjustly put to death. Consult: Felix Dahn, *Die Könige der Germanen*, vol. iii (Würzburg, 1866); Thomas Hodgkin, "Ostrogothic Invasion," in *Italy and her Invaders*, vol. iii (London, 1885); id., *Theodoric the Goth* (New York, 1893); *Cambridge Medieval History*, vols. i, ii (New York, 1911-13); Edward Gibbon, *Decline and Fall of the Roman Empire*, vol. iv, edited by J. B. Bury (London, 1912).

THEODORIC, Tomb of. A structure near Ravenna, Italy, erected about 530 as a mausoleum by Theodoric's daughter. It is now the church of Santa Maria della Rotonda.

THEODOSIA, thē'ô-dō'shĭ-à, or **FEODOSIA,** fā'ô-dō'sē-à. A seaport of the Crimea. See Kaffa.

THEODOSIUS, thē'ô-dō'shĭ-ụs. The name of three Roman emperors.—Theodosius I, surnamed The Great, Emperor 379-395, was of Spanish descent, and was born either at Italica, or, more probably, at Cauca, near Segovia, about 346. His father, also named Theodosius, was the great general of the Roman Empire, who, after freeing South Britain from the Caledonians, and annihilating the formidable rebellion of the Moor Firmus, was beheaded at Carthage in 376. Theodosius accompanied his father in his British campaigns, and afterward, by routing the Sarmatians, saved Mœsia from devastation, but retired from active service after his father's murder, and took up the care of his patrimonial lands in Spain. But on the defeat and death of Valens (q.v.), his colleague, Gratianus (q.v.), feeling his inability to sustain alone the cares of empire, intrusted to Theodosius, Jan. 19, 379, the administration of Thrace, Dacia, Macedonia, Egypt, and the East, and especially the protection of the Empire against the Goths. Theodosius found it most prudent to sow jealousy and dissension among the Goths by promises and bribes, and, after a four years' so-called campaign, succeeded in pacifying the Visigoths, the Ostrogoths retreating towards Scythia. The latter returned in 386, their ranks swelled by Scythians, but were totally routed in attempting to go across the Danube, and the survivors were transported to Phrygia and Lydia. See Goths.

In 387 Theodosius undertook to restore to the throne of the Western Empire Valentinian II (whose sister Galla he married), the brother of Gratian, who had been expelled by Maximus, and after a successful contest captured Maximus and put him to death at Aquileia (388). In 392 the suspicious death of Valentinian and the elevation of the puppet Eugenius by Arbogastes, the real ruler of the West, again made Theodosius interfere; after two years of preparation his army gained a complete victory over the army of the West, and the two portions of the Roman Empire were again united under one ruler. The union lasted only four months, owing to the death of Theodosius, Jan. 17, 395. Though he professed the orthodox Christian faith, Theodosius was not baptized till 380, and his behavior after that stamps him as a cruel and vindictive persecutor. His humiliation before St. Ambrose, Bishop of Milan, for the massacre at Thessalonica, was regarded by the Church as one of its greatest victories over the temporal power. See Ambrose.

Theodosius II, Emperor of the East from 408 to 450, was the only son and successor of Arcadius (q.v.). He was but seven years old when he ascended the throne. The chief events of his reign were the invasion of the Empire by the Huns under Attila, a war with Persia, renewed efforts to extirpate paganism, and the compilation of the *Codex Theodosianus* (see Codex; Code).—Theodosius III was an unimportant Byzantine Emperor (716-717 A.D.), who abdicated after a few months' reign. On all three consult Edward Gibbon, *The Decline and Fall of the Roman Empire*, edited by J. B. Bury (London, 1912); Thomas Hodgkin, *Dynasty of Theodosius I* (Oxford, 1889); id., "Visigothic, Hunnish, and Vandal Invasions," in *Italy and her Invaders*, vols. i, ii (Oxford, 1892); *Cambridge Medieval History*, vol. i (New York, 1911).

THEODOSIUS, Arch of. A triumphal arch at Rome, erected in 405 A.D. at the approach to the Pons Vaticanus, in honor of the three emperors Arcadius, Honorius, and Theodosius, in commemoration of their destruction of the Goths.

THEOG′NIS (Lat., from Gk. *Θέογνις*) (sixth century B.C.). A Greek elegiac poet, born at Nisæan Megara. During the conflict in his native city between the aristocratic and democratic parties, in which he took the side of the aristocrats, he lost his estate and was reduced to poverty and driven into exile. He appears to have visited Sicily, Bœotia, Eubœa, and Sparta, but later, apparently under changed conditions, he returned to his native city. Theognis is the only elegiac poet whose works have come down to us in anything like complete condition. We possess under his name 1389 verses, in two books, which set forth the political belief and ideals of the Dorian oligarchs. The work is fragmentary and has suffered largely from interpolations. The genuine remains of his work are valuable evidence as to the state of political parties and social conditions in the sixth century. The fragments are edited by Bergk in his *Poetæ Lyrici Græci* (5th ed., Leipzig, 1914); by Ziegler (2d ed., Tübingen, 1880); by Sitzler (Heidelberg, 1880); by Hartmann in his *Studies in Theognis* (Cambridge, 1902); and by T. Hudson-Williams (1910). Consult W. C. Wright, *A Short History of Greek Literature* (New York, 1907); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i, part i (6th ed., Munich, 1912).

THEOG′ONY (Lat. *theogonia*, from Gk. *θεογονία*, from *θεός*, *theos*, god + *-γονία*, *-gonia*, generation, from *γόνος*, *gonos*, seed). A genealogy of the gods. The earliest theogonies among the Greeks were that of the epic cycle, of unknown authorship, now lost, and the extant work of Hesiod (q.v.). According to Pausanias, the poems of Onomacritus, who lived at the close of the sixth century B.C., belonged to this class. The Orphic theogony, which had a great influence among the Neo-Platonists, was composed at a late period, although it may have embodied much of the earlier Orphic doctrine.

THE′OLOG′ICAL ANTHROPOLOGY. See Anthropology, Theological.

THEOLOGICAL EDUCATION. The system of training in theology, with special reference to professional preparation for the work of the ministry. It will naturally have to be considered under two main heads, owing to fundamental differences in the point of view.

THE CATHOLIC SYSTEM

The older system of theological education, prevailing in Catholic institutions, is the result of the historical development of the Church. The aim and ideal have remained unchanged, but the matter has broadened and the lines widened and deepened according to the Church's organic activity. The training of the man has ever been its most important function—consisting in the assimilating of his mind to the object matter of theological disciplines and of his conduct to the ideal of the priestly vocation. The first theologians were instructed in the school of Christ. They in turn handed on to their disciples what they had received from their master. Its matter was the Bible, the Old and New Testament, the latter especially, with the oral interpretation gathered and treasured from the instructions of Jesus. The form was simple, unsystematic, adapted to the synthetic rather than the analytic mind. Both aspects—the matter and the form—are indicated with sufficient detail to enable one to estimate their character in the letter of St. Paul to Titus and his two letters to Timothy. Contact with Judaism developed a more definite exegesis, and conflict with paganism a direct apologetic. The necessity of defining and defending the explicit content of revelation resulted in a gradual growth of dogmatics, with a well-marked branch of polemics, while the bearings of the new religious-moral truths on the growing complexities of life in the world and the cloister necessitated an unfolding of moral and ascetical theology. Eusebius in the meantime had founded ecclesiastical history, and with the Decretists and the Decretalists canon law received an organic shape. After the collapse of the Roman Empire educational activity, theological as well as secular, was practically confined to the monasteries, and limited to the conserving of the materials inherited from the past.

Throughout the Middle Ages the various branches of the theological curriculum became more systematic and coördinated. Biblical study was emphasized, though principal attention was given to the philosophico-theological systematization of the speculative content of religious faith and to the motives, faculties, and laws of moral and religious conduct. Historical and critical studies were at this time but superficially cultivated.

A great change begins with the rise of the Humanists and the Reformation, followed by the opposite reform instituted by the Council of Trent. Progress lay principally in the circle of biblical and historical studies. Exegesis was pursued with great zeal, and the study of the Bible centred mainly on historico-critical questions. The founder of isagogics as a special discipline was Richard Simon, and in the second half of the eighteenth century, in which, besides, the division of theology into separate departments was completed, it was marked off against the rest of biblical science. In church history, reëstablished by Baronius (1607), the auxiliary sciences attained chiefly through the Benedictines of St. Maur their form and demarcation: patrology, archæology, and chronology. In criticism of sources Mabillon (1707), in the study of the Catacombs Bosio (1639), in hagiography Bollandus (1665), were most prominent. Besides these Petavius (1652) and Thomassin (1695) established scientifically the history of dogma, which since the latter half of the eighteenth century has been independent. In systematic theology, moral theology, which had made great advance, separated definitely from dogmatic and was raised to an independent discipline. Casuistry received particular interest and care. In dogmatics Melchior Cano (1560) created by his *Loci Theologici* the science of theological noetics, to which Stapleton (*De Principiis Fidei Doctrinæ*) gave scientific finish. In post-Tridentine dogmatics, polemics took a broad and important place. To it men like Bellarmine, Suarez, and Soto devoted their best powers. Mystics and ascetics, earnestly cultivated even in patristic times (their founder was the Pseudo-Dionysius), were greatly developed, but attained no independent position. They remained, like casuistics, in connection with and in the service of moral theology. Thus the theological cycle was, at the close of the sixteenth century, divided into the following departments: biblical science (undivided), church history, dogmatics, moral and canon law. The differentiation of the other theological disciplines was accomplished only in the second half of the eighteenth century. The latest to appear as a separate branch was pastoral theology, in Germany, with the erection of a special chair for its teaching under Maria Theresa. Later on it divided into three departments: homiletics, liturgics, and the theory of the pastoral life. Apologetics, as fundamental theology, though zealously cultivated for centuries, separated from dogmatics only in the nineteenth century.

The actual curriculum of the ecclesiastical, or the diocesan seminary, in which the system of theological education is imparted, dates in its present organization from the Council of Trent, but is the outcome of a gradual historical growth. In the early centuries theological education was received partly at central schools (e.g., at Alexandria and Antioch), but chiefly at the Bishop's residence under his guidance and spirit. The episcopal school was afterward supplemented by the monastic institutions and the schools established by Charlemagne. These in turn were succeeded by the great mediæval universities and the *collegia* attached thereto. The growing laxity of discipline at these institutions induced the Council of Trent to establish the present seminary system. The purpose of these institutions, which exist in almost every diocese or ecclesiastical province, is primarily a moral one. The graded course of study pursued in them averages from 10 to 12 years, divided into three distinct but closely connected stages: the preparatory, the philosophical, and the strictly theological, to which the first two are subordinate. In the preparatory department, special importance is placed on Latin. As this language is the vehicle of most of the subsequent studies—textbook and lecture being usually in Latin—the student passing from the preparatory seminary is required to have an easy reading familiarity and a fair speaking facility in the language. The two years of philosophy are devoted to logic, psychology, metaphysics, and ethics (including sociology), the physical sciences, Hebrew, and Greek. The theological curriculum of four years is organized as follows:

I. *Theology in its Unity* (*Synthesis*).—1. The theologian: his ideal, moral, and intellectual equipment. 2. Nature, origin, and classification of religion. 3. Relation of theology to religion. 4. Object, nature, relations (to reason and faith), history of theological science.

II. *Departments of Theology* (*Analysis*).—*A. Historical.*—1. The Bible, criticism, exegesis. 2. Biblical theology: (*a*) history of the Old and New Testament; (*b*) their general doctrinal contents; (*c*) aids to study: biblical philology, archæology, hermeneutics. 3. Church history: (1) scope, methods, epochs; (2) divisions: (*a*) patrology; (*b*) symbolism; (*c*) ecclesiastical archæology and art; (*d*) auxiliary disciplines: geography and statistics, ecclesiastical chronology, and philology.

B. Systematic Theology.—1. Apologetics. 2. Dogmatics, relations to morals. 3. Moral theology (Christian ethics).

C. Practical Theology.—1. The Christian pastorate as a continuation of Christ's ministry. 2. Divisions: catechetics: pastoral didactics; the instruction of children. 3. Homiletics: theory of sacred eloquence. 4. Liturgy. 5. Theory of the relations of pastor and people.

D. Canon Law.—Science of ecclesiastical discipline.

In the philosophical department empirical psychology, epistemology, and sociology are absorbing more interest and are being pursued in a more historical light and a more critical spirit than was the case a generation ago. The same is true of biblical studies, ecclesiastical history, and apologetics within the theological domain.

There is no attempt at reconstructing theology. The primary principles of that system are the articles of faith contained within the deposit of revealed truth, which, together with the assurance of inerrancy in discerning, formulating, and interpreting them, she claims to have received from her Founder. In the exercise of the logical faculty developing those principles and coördinating the conclusions into a systematic body of theological science, in the work of the critical faculty within the domains of biblical, historical, and scientific studies, she recognizes the fullest rights of human reason, provided it does not usurp the license of transgressing the ascertained manifestations, divine revelation.

THE PROTESTANT SYSTEM

The great leaders of the Protestant Reformation insisted upon the necessity of higher education for the clergy at the universities. This was natural, as they believed in an established church supported by the state, and strongly emphasized the duty of its ministers to inculcate sound doctrine, which necessitates special theological training. The Anabaptist thinkers, who contended for freedom of conscience, liberty of prophesying, and complete separation of church and state, put the emphasis so strongly upon experience and conduct as to make doctrinal agreement a matter of secondary importance, and the education of a special clerical class seem undesirable. It was fortunate that the prevailing tendencies made a home for Protestant theology at the great centres of intellectual life. The theological curriculum at the universities was changed in several respects, particularly by the greater attention given to the biblical studies, the importance attached to the Hebrew and Greek texts, and the more or less determined abandonment of the allegorical method of interpretation. Other Lutheran universities modeled their course upon that prescribed by Luther and Melanchthon at Wittenberg. Between 1529 and 1563 this system was introduced at Marburg, Tübingen, Leipzig, Königsberg, Greifswald, Heidelberg, Jena, Rostock, Upsala, and Copenhagen. Similar courses of theological study were established by Beza at Lausanne, by Calvin at Geneva, and theological schools at Nîmes, Sedan, Saumur, and Montauban followed the same methods. In Holland the University of Leyden (founded 1575) became the centre of Protestant theology. The Free Church in Scotland established three divinity halls at Edinburgh, Aberdeen, and Glasgow, and the theological education at the universities of St. Andrews, Aberdeen, and Glasgow was likewise modified in character. Cambridge, under the teachings of Erasmus, Tyndale, and Latimer, became the foremost exponent of the new theological as well as humanistic teaching, and Vermigli at Oxford expounded Protestant principles of exegesis.

If the theological education of the Reformation period was chiefly characterized by the greater attention paid to the Bible, and a certain movement of thought away from Catholic dogma, its most marked peculiarity in the immediately succeeding period was the inculcation of Protestant dogma, on which a growing emphasis was placed. In Germany the type of teaching represented by Flacius proved more acceptable than that of Melanchthon and his followers, and Calovius bore off the victory over Calixtus and the Helmstedt school. The greatest service rendered by Flacius was the attention he and the other Magdeburg Centuriators paid to the history of the Church. New centres of theological study were created at Giessen, Kiel, Dorpat, Lund, Gröningen, and Utrecht. In Holland the extreme orthodox tendencies prevailing at the Synod of Dort were offset by the influence of Scaliger and Grotius. In the French schools Cameron, Amyrault, and Louis Cappel maintained a more liberal type of thought. The expatriation of the Huguenots left only Montauban as a Protestant school. In England the theological education was less affected by exaggerated doctrine concerning the Bible than was the case in Germany, Switzerland, and Holland. The Colonies were long supplied by ministers who had had their training in European universities. A professorship in divinity was established at Harvard College in 1638, and a similar professorship was inaugurated at Yale in 1740.

A new direction was given to theological education by the Pietist movement. At Halle a university was founded in 1694, where it was possible for Spener and Francke to exemplify their principles. They maintained that the Christian minister must himself have a profound religious experience, that he should not be bound by an oath to teach in accordance with man-made creeds, but that he should proclaim the word of God contained in the Scriptures. In the *seminarium ministerii ecclesiastici* established at Halle in 1714 Francke endeavored to give to converted men such a knowledge of the Bible and such an acquaintance with the practical duties of the pastor as to fit them to be true spiritual leaders. While the demand for a spiritual crisis rather than a normal growth of religious experience could not be carried out in a state church and had a tendency to foster self-deception, the break with dogmatism and the centring of interest upon the practical aspect of the ministry, bore permanent results. The loosening of dogmatic fetters led to biblical criticism, as is seen in Dippel, Edelmann, Michaelis, Zinzendorf, and Semler, and a new estimate of the history of the Church, doing more justice to the heretical bodies, was introduced by Gottfried Arnold.

At the English universities rationalism exercised a greater influence than pietism. This was largely the result of the zealous cultivation of natural science. The idea that revelation itself is to stand or fall by the test of reason was accepted by the apologists as well as by the Deists, by Lardner and Paley not less than by Collins and Toland. From England this rationalistic movement spread to the Continent. In the school of the Remonstrants at Amsterdam, Le Clerc expounded to theological students the principles of Collins and Locke. Göttingen was established in 1737, largely to serve as a bulwark against supernaturalism, and other centres of rationalism were Jena, Helmstedt, and Heidelberg. Theological students came under the influence not only of Eichhorn, Paulus, and Henke, but also of such men as Reimarus and Lessing, Herder and Goethe, Kant and Fichte. Each movement had its value. Pietism laid stress upon the consciousness of an inner change, and tended to the supremacy of religious emotion; rationalism put the emphasis upon the reasonableness of true religion and the supremacy of morality.

During the nineteenth century certain important changes occurred. A large number of schools grew up in Europe and America. In Germany the most important additions were the universities of Berlin (1810), Bonn (1818), and Strassburg (reorganized 1871). In Switzerland schools unsupported by the state have been established at Geneva, Lausanne, Neuchâtel, Basel, Bern, and Zurich, and state universities teaching theology at Fribourg and Neuchâtel. In France the theological faculty of the University of Strassburg was removed to Paris in 1877, and the Ecole des Hautes Etudes was founded in 1868. The University of Amsterdam was established in 1877, and universities were founded in Christiania in 1813, and Helsingfors in 1827. In England, besides Oxford, Cambridge, and Durham, the Church of England has 23 theological schools, the English Methodists 10, the Congregationalists 11, the Baptists 9, the Presbyterians 3, the Unitarians 1, and two are undenominational. Except the Dutch Reformed Seminary at New Brunswick, N. J. (1784), and the United Presbyterian Seminary at Xenia, Ohio (1794), all Protestant schools of theology in the United States were founded in the nineteenth century. They number about 120. When the large extent of territory, the numerous denominations, and the special needs of the colored and the foreign churches are considered, the number is not excessive, although many of them are still very inadequately equipped. Some of the schools are connected with universities. Many are located in or near important educational centres. The course is generally three years in length, and a collegiate training is as a rule required for admission.

A tendency to seek independence of educational control is characteristic of the period. In Germany, Switzerland, Holland, and France the principle of academic freedom has won general recognition. Berlin at the outset repudiated all attachment to any particular creed or school. While pressure is often brought to bear in the matter of appointments, the tradition of a German university is generally the determining feature. In Holland the relations between pulpit and chair are more cordial. In England and Scotland freedom of investigation is now generally granted to the biblical teachers. In the United States and Canada theological schools arose under the control of the denominations, and only a few, like Harvard and Union Seminary, are yet independent. In some schools the connection has become more nominal than real, and there is freedom of teaching, while the students are drawn from various denominations, as in Yale and the University of Chicago. Some others are strictly denominational schools. The advantages of university connection have drawn schools into affiliation with universities, as

Harvard, Chicago, Columbia, Pennsylvania, California, and others.

The most significant change in theological education during the century was the general introduction of historico-critical methods of investigation. In the interpretation of Hebrew and early Christian literature, and the study of Church history, German theological teachers have been the chief leaders; but, owing to the relations of the faculties to the Christian state as well as to the Church, no provision is yet made in any German university for the comparative study of the religions of mankind. Paris offers the amplest facilities for such study, but Leyden and Amsterdam also pay considerable attention to it. Critical methods prevail in Old Testament exegesis in Great Britain and America, as well as in the European universities. There is less consistency in their application to New Testament exegesis. The treatment of ecclesiastical history is characterized by increasing fairness and objectivity. While many contributions have been made to dogmatics by theological teachers, the acceptance of the results of criticism has tended to render impossible the old type of systematic theology. As an attempt to explain the Bible, biblical theology has taken its place. As a statement of the meaning of creeds, the history of doctrine supplies its place. As an attempt to bring all truth into one system, it becomes a statement of philosophy and religious psychology. Theology has been enlarged from a system of reason supported by proof texts to a religious philosophy of the world, based on the whole range of natural science and human experience. The broadening view of religion has also caused a new emphasis on religious education and social subjects.

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THEOLOGICAL SEMINARY OF THE REFORMED CHURCH IN AMERICA. A divinity school at New Brunswick, N. J., organized in 1784. Its classes were held in New York City until 1796, then at Flatbush, L. I., for a year or more, and again in New York, till 1810, when it was removed to its present home. The seminary is under the direct control of the General Synod of the Reformed church. Its theology is in sympathy with the moderate Calvinism of the Reformed church standards. The school has a well-equipped dormitory, Peter Hertzog Hall; a capacious building, James Suydam Hall, devoted to lecture rooms, museums, and gymnasium; a fireproof library in the Gardner A. Sage building, containing in 1915 over 52,000 volumes; and five dwelling houses for professors. In 1915 the endowment of the seminary was over $650,000, and the attendance was 29, with a faculty of eight instructors. The president in 1916 was J. P. Searle.

THEOL′OGY (Lat. *theologia*, from Gk. *θεολογία*, a speaking concerning God, from *θεός*, *theos*, god + *-λογία*, -logia, account, from *λέγειν*, *legein*, to say). A term which, in the larger sense, may be used as equivalent to the science of religion, and will then include all the various theological disciplines, the sacred languages, and the interpretation of the Bible; the history of the Church, including the history of doctrine; the history of religions in general; the contributions of our own age to the knowledge of the objects of theological study from other sciences, such as biology; systematic theology, or the system of doctrines and duties; and, finally, practical theology, or the application of theology to life, in the pulpit, in Church administration, and in the various forms of contact with the world. But more strictly and correctly, the term "theology" is employed at present of systematic theology, which may be defined as the science of Christianity, or the scientific explanation of the Christian life, the development of its characteristic principles, conditions, and general relations. Viewed thus it yields a system of doctrines and a system of duties, or dogmatics and ethics. The term was used in the early and mediæval Church in a narrower sense, to mean the specific doctrine of God, the rest of the field now covered by the word being called sacred doctrine. This is the meaning of it as late as Aquinas.

The claim of theology to be a science depends upon the question whether there are any peculiar facts of which it takes cognizance, as it professes, and whether its method is calculated to yield reliable knowledge. It claims as its field two classes of facts—Christian experience and the teachings of the Bible. In method, theology has followed, with other sciences, the prevailing methods of thought in the various ages. In earlier times this was a priori, and the general conservatism of everything connected with religion tended to retain the a priori method as long as possible, but in modern times theology uses the modern methods of inductive reasoning, desiring to find the truth rather than, as in scholasticism, to prove traditional doctrines.

Formerly a sharp distinction was drawn between natural and revealed theology. The former embraced those doctrines as to God, freedom, and immortality which could be reached without the aid of revelation, and upon them was built the proof of the Bible as a revelation from God, and consequently the system of revealed theology, which was then conceived as exclusively the scientific interpretation of the Bible. But with the increasing evidence that even the first doctrines of natural theology, such as the existence of God, have been historically dependent upon a human experience which may be regarded as revelation, and that the doctrines of revealed theology have their confirmation in facts drawn from other sources than the Bible, the sharp line between the two departments has been largely erased. Natural theology is now replaced by apologetics, the business of which is to defend the doctrines developed by systematic theology.

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THEOLOGY, MERCERSBURG. See MERCERSBURG THEOLOGY.

THEOLOGY, NATURAL. See NATURAL THEOLOGY.

THEOLOGY, PATRISTIC. See PATRISTIC THEOLOGY.

THE′ON (Lat., from Gk. Θέων) **OF ALEXANDRIA** (c.370 A.D.). One of the last of the Greek mathematicians and astronomers. He was a teacher at Alexandria and the father of the celebrated Hypatia (q.v.), whose name is also connected with the history of mathematical science. Theon's chief works are an edition of Euclid's *Elements* and a commentary on Ptolemy's *Almagest*. The former was prepared for his students at Alexandria and the various manuscripts have played an important rôle in all subsequent attempts to reproduce the *Elements*. The latter is especially valuable for its notes showing the use of sexagesimal fractions and the operations of division and square root.

THEON OF SMYRNA, smĕr′nȧ (c.100 A.D.). A Greek mathematician and astronomer. He was the author of a work, commonly known as the *Expositio*, treating of mathematical rules necessary for the study of Plato. Two books of this work, probably the whole of it, are extant, one on arithmetic and the other on astronomy. The work contains two propositions on the theory of numbers of peculiar interest: (1) If n is any number, n^2 or $n^2 - 1$ is divisible by 3 or 4 or both. If n^2 is divisible by 3 and not by 4, $n^2 - 1$ is divisible by 4. (2) If two groups of numbers are arranged as follows:

$$\begin{array}{ll}
n_1 = 1 + 0 & d_1 = 1 + 0 = 1 \\
n_2 = 1 + 1 & d_2 = 2 + 1 = 3 \\
n_3 = 2 + 3 & d_3 = 4 + 3 = 7 \\
n_4 = 5 + 7 & d_4 = 10 + 7 = 17 \\
\cdots\cdots & \cdots\cdots\cdots \\
\cdots\cdots & \cdots\cdots\cdots \\
n_r = n_{r-1} + d_{r-1} & d_r = 2n_{r-1} + d_{r-1},
\end{array}$$

then d^2 is of the form $2n^2 \pm 1$; e.g., $d_1^2 = 1 = 2 \cdot n_1 - 1$, $d_2^2 = 9 = 2 : n_2^2 + 1$. Theon called these numbers *diameters*. It is interesting to observe that the ratios

$$\frac{d_1}{n_1} = 1,\ \frac{d_2}{n_2} = \frac{3}{2},\ \frac{d_3}{n_3} = \frac{7}{5},\ \ldots$$

are the convergents of the continued fraction

$$1 + \frac{1}{2+}\frac{1}{2+}\frac{1}{2},\ \ldots$$

and hence approximate the value of $\sqrt{2}$; also that these diameters are solutions of a pair of indeterminate quadratic equations, relations unknown to Theon. See PELL, with reference to the Pell Equation.

THEOPH′ANO (c.955–91). The wife of Otho II of the Holy Roman Empire. She was the daughter of the Byzantine Emperor Romanus II, and was married to Otho II at Rome in 972. She was a woman of great beauty and noble character and soon won great influence over the Emperor, in whose court she introduced much of the learning and refinement of Constantinople. After the death of her husband (983) she ruled as Regent for her son Otho III till her death.

THEOPH′ANY (ML. *theophania*, *theofania*, from Gk. *θεοφάνια*, *theophania*, *θεοφάνεια*, *theophaneia*, from *θεός*, *theos*, god + *φαίνεσθαι*, *phainesthai*, to appear). An appearance of gods, or of God, to men. In the heathen religions theophanies under various forms were regarded as of frequent occurrence. In Christianity the term was often applied in the ancient church to the appearance of God in Christ, in distinction from the *epiphany*, which was the appearance in the form of a dove, and the audible communication of God, at the baptism of Jesus (Mark i. 9–11 and parallels). It is now generally restricted to the appearances of God as related in the Old Testament, whether in personal form or by any other means.

THEOPHILUS, thė̂-ŏf′ĭ-lŭs (from Gk. Θεόφιλος, beloved of God). The name of the person to whom two New Testament books, the third Gospel and the Acts, are dedicated (Luke i. 3; Acts i. 1). In Luke i. 3 he is addressed as "most excellent" (Gk. *κράτιστε*), from which one would naturally infer that he was a man of rank or high position, but not necessarily (cf. Ramsay, *St. Paul the Traveler*, p. 388 f.) a Roman official of equestrian rank. The natural inference from Luke i. 4 is that he was a convert to Christianity, having already received the instruction usually imparted to new converts.

The name Theophilus was not uncommon in Jewish circles, being borne by a high priest who held office 37–41 A.D. (cf. Josephus, *Ant.*, xviii, 5, 3; xix, 6, 2), and even as early as c.254 B.C. it was held by a member of a Samaritan community in Egypt (cf. Deissmann, *Bibelstudien*, p. 19). The Jews may have considered it the equivalent of the Heb. El-dad (probably "beloved of God"), but it was in use also as a pure Greek name long before the Christian era. Hence one should not infer that Theophilus must have received this name as his Christian name when baptized. Nothing whatever is known of his history, not even his place of residence.

THEOPHILUS. The hero of a mediæval legend, which became a precursor of the Faust legend. The facts appear to be that in the sixth century there was a Theophilus who was treasurer of the church at Adana, near Tarsus, in Cilicia Secunda. He was elected Bishop, but refused the honor, out of humility. Later he quarreled with the new Bishop, but on repentance was forgiven. These facts were embellished by later story-tellers, until the legend arose that the devil tempted and finally won him, making him sign a contract, with his blood, to give his soul in exchange for the glories of this world. Later he repented and prayed to the Virgin, who then tore the parchment from the very claws of Satan and returned it to Theophilus. This act became one of her celebrated miracles. The legend was brought to the West in the tenth century, and quickly spread far and wide. It was made the subject of poems and dramas in many languages, and frequent allusions to it are found in Latin, German, Anglo-Saxon, Icelandic, Swedish, French, and Spanish literature, while it is also the subject of many celebrated sculptures, particularly some in Notre Dame, Paris.

THE'OPHRAS'TUS (Lat., from Gk. *Θεόφραστος*) (c.372–287 B.C.). A Greek philosopher, born at Eresus in Lesbos. He studied philosophy at Athens, first under Plato and subsequently under Aristotle, who at his death made him head of the Peripatetic school, which he directed for 35 years (322–287). Under his leadership the character of the school was well maintained; it had a large number of pupils, and enjoyed a high reputation at home and abroad. In philosophy he followed closely in the footsteps of his master, but was more inclined to natural history than to metaphysics. His discourses on ethics were greatly admired, but his chief renown was gained by his botanical works. Two of these, his *History of Plants*, in nine books, and his *Theoretical Botany*, in six, are still extant, together with fragments of his work *On Mineralogy* (Περὶ Λίθων), *On Fire* (Περὶ Πυρός), *On the Senses* (Περὶ Αἰσθησέων καὶ Αἰσθητῶν), *Metaphysics* (Μεταφυσικά), and other similar subjects. Especially famous is his book of sketches called *Characters* (Χαρακτῆρες). They have been extremely popular and have been imitated many times, especially by the French and English of the eighteenth century. The best complete editions of his works are by Schneider (Leipzig, 1818) and by Wimmer (Paris, 1866). The *Characters* have been many times edited separately. Especially famous are the edition by Casaubon with commentary (Leyden, 1592); that by R. C. Jebb (London, 1870; revised by J. E. Sandys, 1909); and the edition, with translation and commentary, by the Leipzig Philological Society (1897). Consult: Eduard Zeller, *Aristotle and the Earlier Peripatetics* (Eng. trans., London, 1897); Theodor Gomperz, *Greek Thinkers*, vol. iv (Eng. trans. by G. G. Berry, New York, 1912); H. Ritter and L. Preller, *Historia Philosophiæ Græcæ* (9th ed., Gotha, 1913).

THEOPH'YLACT (Gk. *Θεοφύλακτος*, *Theophylaktos*) (died c.1107). A Bible commentator. He was a deacon at Constantinople and became tutor to Constantine Porphyrogenitus, son of Michael VII. In 1078 Theophylact was made Archbishop of Achrida and Metropolitan of Bulgaria. He labored diligently to extend Christianity, but was hindered by the half-civilized people of his diocese, and vainly endeavored to lay down the duties of his office. He wrote valuable commentaries on the minor prophets and on the greater part of the New Testament. In addition he wrote 130 epistles and a number of tracts, including one on *Education of Princes*. His commentaries are founded on those of Chrysostom (q.v.). His exegesis is direct, precise, and textual in its treatment. His works were much esteemed by later writers. J. F. B. M. de Rossi published his works in Latin and Greek at Venice in 4 folio volumes (1754–63). Consult Karl Krumbacher, *Geschichte der byzantinischen Litteratur* (2d ed., Munich, 1897).

THE'OPHYL'LINE. See ALKALOIDS.

THE'OPOM'PUS (Lat., from Gk. *Θεόπομπος*) **OF CHIOS** (c.378–c.300 B.C.). A Greek historian. In early life he left home with his father, who was banished on account of his predilection for the Spartans, and took refuge in Athens. There he was trained in oratory by Isocrates. Besides numerous panegyrics, of which that on Mausolus was the most celebrated, his works included *Σύνταξις* Ἑλληνικῶν, or Ἑλληνικαὶ Ἱστορίαι, a *History of Greece* in 12 books, embracing the period from 411 B.C., where Thucydides breaks off, to the battle of Cnidus, in 394; and Φιλιππικά, in 58 books, a history of the life and times of Philip of Macedon. Of these works only fragments remain, but an abridgment of the Latin translation of the Φιλιππικά, by Trogus Pompeius, has been preserved by Justin. Ancient critics commend his accuracy, but blame him for harshness and illiberality. This was due to his fearless exposition of the corruption of his day. According to Pliny, the Elder, he was the first Greek writer to make any definite mention of Rome. For the fragments, consult Müller, *Fragmenta Historicorum Græcorum* (Paris, 1841); Bünger, *Theopompea* (Strassburg, 1874); and a complete edition, including the fragments of Cratippus by Grenfell and Hunt, in *Hellenica Oxyrhynchia* (Oxford, 1909). Consult Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i (5th ed., Munich, 1908); J. B. Bury, *The Ancient Greek Historians* (New York, 1909); E. M. Walker, *The Hellenica Oxyrhynchia* (Oxford, 1913).

THEOR'BO (It. *tiorbo*, etymology unknown). An obsolete musical instrument of the lute family, of which it formed the bass. Besides strings running over the finger board, it had a number of bass strings stretched alongside of the board. These strings were longer and were fastened in a separate neck attached to the neck containing the strings stopped by the fingers. The theorbo was indispensable in the orchestra of the seventeenth century and was used for accompanying the voice. See Plate of MUSICAL INSTRUMENTS.

THE'OREM (Lat. *theorema*, from Gk.

θεώρημα, sight, principle considered, rule, theorem, from *θεωρεῖν*, *theōrein*, to view, from *θεωρός*, *theōros*, spectator, from *θεᾶσθαι*, *theasthai*, to view, behold). In mathematics, a proposition to be demonstrated. A theorem consists of two parts: the hypothesis, or the given, and the conclusion, or what is to be proved. One theorem is the converse of another when the conclusion and the hypothesis are interchanged in the two theorems. The converse of a theorem is, however, not necessarily true. A corollary (q.v.) of a theorem is a truth easily deduced from it and not requiring a separate demonstration. A lemma (q.v.) is generally a theorem used to prepare the way for another theorem.

THEORY. See HYPOTHESIS.

THE′OSOPH′ICAL SOCIETY. A society founded by Helena Petrovna Blavatsky (q.v.) in New York, Nov. 17, 1875, assisted by Col. Henry S. Olcott, William Q. Judge, and others. Its objects were: (1) to form the nucleus of a universal brotherhood of humanity; (2) to study and make known the ancient religions, philosophies, and sciences; (3) to investigate the laws of nature and to develop the divine powers latent in man. Blavatsky left New York, Dec. 17, 1878, and went to India, accompanied by Colonel Olcott, where a system of propaganda was organized and numerous branches were formed. Judge remained in New York, and built up the society in the United States. He formed a strong branch, the Aryan Theosophical Society, in New York City, of which he was president. Madame Blavatsky left the Theosophical Society as an international body with headquarters at Adyar, India, and with three sections: the Indian, comprising the Orient; the English Section, having jurisdiction over Europe; and the American Section for America. Olcott, at Adyar, was president; Judge, at New York, vice president. Each section had a general secretary—Bertram Keightley, of Adyar, of the Indian; G. R. S. Mead, of London, of the English; and Judge, of New York, of the American Section. There was an inner body, the Esoteric Section (E. S.), at the head of which was Madame Blavatsky. At her death, in 1891, she was succeeded by Judge and by Annie Besant, of London, jointly, both supposedly mouthpieces of an unknown master, the real head of the theosophical movement. Charges of fraudulent use of this master's name were preferred against Judge by Mrs. Besant. These charges, though never legally proved, caused a split between the supporters and opponents of Judge. In Boston, in April, 1895, the American Section almost unanimously declared its autonomy as the "Theosophical Society in America" (T. S. in A.), with Judge as president. It then had about 150 branches, and in 1916 it had 157 branches with about 5000 members. In so far as these members belonged to the Esoteric Section, they recognized Judge as the outer head (the real head being the unknown master), and, following their example, those Theosophists throughout the world who believed the charges false formed independent bodies in their separate countries, called respectively the Theosophical Society in England (T. S. in E.), in Sweden (T. S. in S.), in Australia, etc.

The society under Olcott kept up its organization, though the English and American sections were much weakened. Mrs. Besant remained the head of that Esoteric Section which was connected with the society under Olcott. Judge died March 19, 1896, leaving his society in a flourishing condition, but with no successor as head of the Esoteric Section, or the T. S. in A. Katherine A. Tingley then obtained recognition, first from a few members, and through skillful advances from the bulk of the society, as the successor of Blavatsky and of Judge. At a convention in Chicago, in February, 1898, she formed "The Universal Brotherhood Organization," of which she was the absolute ruler, and the possessor of all its property. Of the remnants of the T. S. in A. she made a literary department of her "Universal Brotherhood." The headquarters in New York City were abandoned and she took her remaining followers, not more than a dozen of the old members of the T. S. in A., to Point Loma, near San Diego, Cal., where she formed a colony. The Theosophical Society in America, after Tingley's departure for Point Loma, soon divided, one of the sections having headquarters in New York and the other in Brooklyn. The theosophical movement continues, however, on the one hand as the organization, and on the other, under the form of independent local societies, recognized as theosophical by their adherence to the three objects of the society. Since the foundation of the Theosophical Society in 1875 over 1400 branches have been chartered in different countries. In 1906 the total membership in all countries was approximately 30,000. The parent society is international, with headquarters at Adyar, Madras, India. In 1916 Mrs. Annie Besant was president.

THEOS′OPHY (Gk. *θεοσοφία*, *theosophia*, wisdom in divine things, knowledge concerning God, from *θεός*, *theos*, god + *σοφός*, *sophos*, wise). A name used for any system of philosophy which starts from a supposed knowledge of God, and proceeds to state laws of the universe on the basis of revelation or of direct knowledge. Usually the claim of a supernatural revelation is made, though this is not essential, and usually, also, theosophy is mystical, holding that systems of truth are revealed through states of mystic feeling. The term has been applied to cults of varying tenets and diverse uses of the concepts of divinity at different periods. Ancient systems of belief falling under this head may be divided roughly into Oriental and Occidental, the former being the older. The earliest traces of theosophic thought are found in the Sanskrit Upanishads (q.v.), which represent mystic meditation on the nature of the All-Soul or Atman. It is in a sense true that all subsequent Hindu philosophy is theosophic. From India this mystical speculation spread to Persia, and from the Persians it was absorbed by the Arabs after their conquest of Iran. In a somewhat similar sense the *Yi-King* and the *Tao-teh-King* of China may be regarded as theosophic.

Among the Jews a theosophy attained wide currency in Europe between the twelfth and sixteenth centuries. The teachings of the Cabbàla (q.v.) as represented in the writings of Simeon ben Jochai and Moses de León, however, are so widely different from the theosophy of India as to preclude any idea of Hindu influence. On the other hand, the caballistic doctrines were profoundly modified by what may be regarded as the typical Occidental theosophy. Neoplatonism (q.v.), represented by Ammonius Saccas, Plotinus, Porphyrius, and Proclus, and by the Gnostics, represented by Valentinus and Basilides. In the Middle Ages theosophy was taught by Tauler, Eckhardt, Paracelsus, Van Helmont, Robert Fludd, Thomas Vaughan, Heinrich Kunrath, Jakob Boehme, Johann Georg Gichtel, and later by Count Saint-Martin and Schelling. At different periods in history men appeared, claiming to teach the immortality of the soul, and the existence of a vast cosmos, moved by occult forces, of which cosmos this earth is but an infinitesimal part. They claimed to show the instability of material existence, the reality of an occult world reaching everywhere into ours.

In modern times the name "theosophy" has been given to a form of belief promulgated by a Russian, Madame Blavatsky (q.v.), who gave out doctrines concerning cosmogony and anthropology, which, she said, were obtained from certain Masters who had reached a higher plane of existence than ordinary mortals. The system of thought and the terms used are largely drawn from Hinduism and Buddhism. Adept, Master, Mahatma (q.v.) represent different degrees of individual spiritual development in the theosophical system, the Mahatma being the highest. The authoritative work on modern theosophy is Madame Blavatsky's *The Secret Doctrine*, which states "the three fundamental propositions" as follows: (1) An omnipresent, eternal, boundless, and immutable principle on which all speculation is impossible, since it transcends the power of human conception and could only be dwarfed by any human expression or similitude. (2) The eternity of the universe in toto as a boundless plane, periodically the playground of numberless universes incessantly manifesting and disappearing—the law of periodicity. (3) The fundamental identity of all souls with the universal Over-Soul, the latter being itself an aspect of the unknown Root; and the obligatory pilgrimage of every soul—a part of the Over-Soul—through the cycle of incarnation in accordance with cyclic and karmic law, during the whole term. The esoteric philosophy admits of no privileges or special gifts in man save those won by his own Ego through personal effort and merit throughout a long series of reincarnations.

According to theosophic teaching, God is said to be infinite and absolute. Therefore, no attempt is made to qualify or describe the Great Unknown, which is the source of both matter and spirit. These are the two aspects of one root nature. According to immutable law, the spirit involves into matter and matter evolves the spirit. Thus there is a circulation downward and upward, from spirit into matter and from matter to spirit. Evolution is accepted, but only as half a law, whose other half is involution.

All worlds pass through seven great periods of manifestations called rounds. Spiritual at first, they become denser and darker in the downward cycle, the fourth of which is the densest and our present material world. Thence begins its upward movement towards spirituality. The advantage gained is the experience and ultimately the emancipation of the soul. In each of these rounds, periods of incalculable duration, there are seven great root races. Each root race has seven subdivisions or subraces corresponding with the rounds, which become more material from the first to the fourth. We are at present in the fifth subrace of the fifth root race, and on the upward cycle of the fourth round. Evolution is constant progress, an unfolding of consciousness from the most primitive forms of life to the highest intelligence.

All souls are the same in essence, but they differ in degrees of development; each bears a certain relation to the others and to the whole. The more advanced souls are the natural guardians of the less developed. Man is composed of seven principles, which are divided into a lower or mortal, and a higher or immortal nature. The lower nature, constituting his personality, is fourfold. One-fourth, the physical body, is visible, three-fourths invisible. These three are the astral or design body (*linga śarīra*), on which are molded the physical atoms, then the life principle, and the principle of desire. The physical body (*sthūla śarīra*) is material without form. It is held in form by the astral body, and moved to action by the fire of desire (*kāma*). This fourfold nature is common to all animal beings, is mortal and subject to dissolution at death. The higher nature of man is threefold, the mind (*manas*), soul (*buddhi*), and spirit (*ātman*). The mind distinguishes man from the animal. Entering the animal body, the mind thinks of itself as separate from others. The soul is universal, overcoming separateness and showing relationship of soul with soul. The spirit is the one indivisible which passes through all things and unites them with each other. Death is the separation of the principles. The physical body returns to the elements which gave it. The astral body disintegrates more slowly. The life (*prāṇa*, literally "breath") passes at once into the universal life (*jīva*). Desire forms itself into a body (*kāmarūpa*) which gradually becomes exhausted, leaving seeds (*skandhas*), from which the returning soul forms a later and new personality.

The trinity of mind, soul, and spirit, when freed from the trammels of a mortal garment, passes through certain states of consciousness until it reaches the condition called heaven (*dēvacāna*), where it enjoys a period of bliss and rest proportionate to its good thoughts and ideals while on earth. When these exalted ideals have been exhausted, its period of rest is at an end and it descends gradually to earth. The trinity, after enjoying its rest, and realizing those ideals which could not be attained on earth, is attracted again to earth by the unfulfilled longings and desires which remain behind as seeds. These it animates. It sinks into the emotional world, is attracted to a particular family, who can furnish a body and surroundings suited to its new experience, and is reborn into this world. The higher nature must become consciously immortal, i.e., it must acquire a continuity of consciousness, thus making it consciously immortal while in the physical body. One earth life is not sufficient. Hence rebirth into the school of life is the lot of the soul until all the lessons have been learned. This doctrine is closely associated with that of Karma, which is the law of balance, of action and reaction, of effect inevitably connected with the preceding cause. It returns to man measure for measure his good or evil thoughts and deeds. It is inseparable from reincarnation. When at last Karma is exhausted, and no desire, either good or evil, is left to produce a new Karma, then reincarnation will cease.

The phenomenon of life is a question of planes or states of consciousness. Human or "I am I" consciousness (*manas*) is the self-identifying of the consciousness, as being distinct and separate from others by the intelligent principle of mind. At this point a man may rise to the divine or sink below the consciousness of the brute—at will. Universal or "I am thou and thou art I" consciousness (*buddhi*) is the relating of the elements and of all souls with each other, thus overcoming the sense of separateness of the mind by the principle of the divine soul. Divine consciousness (*âtman*) sees no separateness, but unites all as one.

Hell (*avici*) is a low and depraved condition on this earth. A life of intense selfishness and wickedness with no spiritual thoughts or aspirations causes the immortal soul to abandon the body before death. In such a case, it is not, however, the soul, but the body with the lower principles which is lost. After the death of such a body the desires with a reflection of the mind may be reincarnated in human form almost immediately. Such a creature is entirely material and animal, intensely selfish in its propensities, and doomed to final destruction, unless it makes a strong appeal to its divine soul, in which event the soul might again connect with it and try to help it on its upward path.

In man divine powers are latent, for he is essentially a soul, a divine being. By purification and training of the body, the latent and divine powers will develop and become active. In every period of evolution a number of souls reach perfection. They are men whom the bonds of personality no longer bind to the attractions of the senses. They have consciously related themselves to the source of their being and have become one with the divine. They watch over humanity and are its guardians. Although they have earned their freedom from rebirth, they prefer to remain in contact with men on earth, to teach and to guide them. At certain periods some appear among men as great lawgivers, rulers, teachers; and their agents found religious systems and schools of philosophy.

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THEOTOCOPULI, thā-ŏ'tŏ-kŏ-pōō'lē, DOMENICO, known as EL GRECO (the Greek) (c.1547–1614). The foremost Spanish painter of the sixteenth century. He was born at Candia, Crete, and went early to Venice, where, between 1560 and 1570, he studied with Titian, but was most influenced by Tintoretto. Through his compatriot Giulio Clovio, the miniature painter, he secured in 1570 the patronage of Cardinal Alessandro Farnese at Rome, where he practiced his art till c.1576. He then removed to Toledo, having received an important commission from the dean of the cathedral. There is record in 1577 of a lawsuit with the chapter of the cathedral over his painting "L'Expolio," to which they objected on financial and theological grounds. Another ambitious effort, "The Martyrdom of San Mauritius" (Escorial), painted for Philip II, failed to meet with the approval of that monarch. He was successful enough, however, at Toledo, where the rest of his life was spent. He received important commissions from churches, religious houses, and the nobility. The princes of the Church, civic rulers, and notables of Toledo sat to him for portraits, besides the poets, scholars, and artists whom he reckoned among his friends. He was a man of fine culture, the possessor of a library rich in classic and religious lore, and wrote an important work, *The Art of Painting*, now lost. He lived in state in the 24 best rooms of the large palace of his friend, the Marquis of Vilena, which lay high over the Tajo, with the fine view of Toledo seen in his landscapes (Greco Museum, Toledo, and Havemeyer collection, New York). Part of the palace is now a museum bearing his name. All Toledo mourned his death (April 7, 1614), and he was interred like a noble in the church of Santo Domingo. Five sonnets, written by distinguished poets, extolled his merits.

The early or Italian period of El Greco's work shows the influence of Venetian color, Tintoretto's light and shade, and of Michelangelo in foreshortening and movement. Here belong such works as "Christ Healing the Blind Man" (Dresden and Parma); "Boy Lighting a Coal" (Naples Gallery); the "Adoration of the Shepherds" (Vienna Gallery); and a "St. Jerome" (National Gallery, London).

His early work at Toledo shows a transition from the Italian to his later style, as may be seen in the decorations of Santo Domingo (1577), the central picture of which, "The Ascension," is now in the Art Institute, Chicago; in "Christ Despoiled of his Garments" (L'Expolio) (1579), still in Toledo Cathedral; and the "San Mauritius" mentioned above. From c.1584 his color becomes colder, with a subtle use of blues, grays, and pale reds, strong contrasts of pure color, increasing emotional intensity, and more dramatic light and shade effects. El Greco became the foremost exponent of Spanish mysticism in painting. The masterpiece of this period, if not of all his works, is the "Burial of Count Orgaz" in San Tomé, a marvel of color and dramatic feeling and fine composition. Others are: "The Baptism of Christ," "The Resurrection," "The Crucifixion," and "The Annunciation," all in the Prado, Madrid.

His latest style, beginning about 1604, shows increasing emotional intensity with a corresponding neglect of technique, the figures being elongated out of all proportion in an effort to obtain imaginative, visionary effects. To this period belong "Christ Dead in the Arms of God the Father," "The Ascension of San Vicente" (finished in 1613); the five scenes from the "Life of Mary Magdalen" (church of Titulcia); "The Pentecost" (Prado, Madrid); "Christ's Agony in the Garden" (Lille Museum); and his last work, "The Baptism of Christ," in the Hospital of San Juan, Toledo.

El Greco's highly subjective portraits show a wonderful subtlety of delineation. Among the best-known examples are those of Giulio Clovio (Naples Museum); the "Man with his Hand on his Breast" (Prado, Madrid); the "Grand Inquisitor of Spain" (Havemeyer collection, New York); a "Portrait of a Lady" (Van Horne collection, Montreal); "A Young Greek Woman" (Sir John Stirling Maxwell, London). Of the numerous portraits reputed to be of himself the best and seemingly most authentic belongs to Señor Beruete (Madrid). His art can best be studied at Toledo, in the Museo del Greco, the hospital, the cathedral, and other churches. In the Prado, Madrid, are 24 examples, in the Escorial six. He is next best represented in the United States. In New York the Hispanic Society possesses six, including several excellent examples; the Frick collection three; the Havemeyer three; and many are owned by dealers, two of whom held exhibitions of his works in March, 1916. In Philadelphia there are three examples in the Johnson and two in the Widener collections. He is also represented in the public collections of New York, Boston, and Chicago, and in those of Great Britain, France, and Germany, and particularly in the Royal Gallery at Bucharest, Rumania.

El Greco was also an architect, and designed the great altars containing his most ambitious pictures, and the wooden statues decorating them. The most important surviving example is a portion of the lost altar of the "Expolio," in the seminary of Toledo. His son, JORGE MANUEL (1578–1631), assisted his father, and later succeeded him as architect to the cathedral. El Greco's principal pupil was Tristan, and he certainly exercised an influence on the young Velázquez. At the present time El Greco is one of the most popular of all the old masters, his works commanding the highest prices. More than any other old master he influenced the Post-Impressionists (see POST-IMPRESSIONISM), who claimed him as a forerunner.

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THE′RA. The ancient name of Santorin (q.v.), one of the Cyclades. The chief town is Thera.

THERAMENES, thê-răm′ē-nēz (Lat., from Gk. *Θηραμένης*) (?–404 B.C.). An Athenian politician. In 411 B.C. he was a leading member of the oligarchy of the Four Hundred at Athens, but soon, going over to the opposition, took a leading part in the deposition of that body. In 410 he took part in the battle of Cyzicus, and in 408 was present at the siege of Chalcedon and the capture of Byzantium. At the battle of Arginusæ, 406, he was one of the subordinate officers in the Athenian fleet, and after the battle was ordered to return to the spot where the action had taken place and rescue such of the disabled ships and their crews as he could. A severe storm having intervened, he found it all but impossible to execute this order, and as a result a large number of Athenian citizens were drowned. Then, anticipating the wrath of the people, he hastened to Athens and accused the commanders in chief of negligence. When, in 404 B.C., Athens was besieged by the Lacedæmonians, Theramenes was sent to Lysander to arrange a peace, but, after remaining in Lysander's quarters more than three months, until the Athenians were reduced to such a state of suffering that they were ready to submit to any terms, he returned to report that he could accomplish nothing, but that an embassy must be sent to the Spartan ephors. Being a second time sent forth, this time to Sparta, he concluded a peace unfavorable to the Athenians. He was chosen one of the Thirty Tyrants (q.v.) who were set up at Athens, but, taking sides against the more violent members of that body, he was accused by Critias of being a traitor and was put to death. Consult Pöhlig, *Der Athener Theramenes* (Leipzig, 1877), and B. Perrin, "The Rehabilitation of Theramenes," in *The American Historical Review*, vol. ix (New York, 1904).

THER′APEU′TÆ (Neo-Lat. nom. pl., from Gk. *θεραπευτής*, *therapeutes*, attendant, servant, from *θεραπεύειν*, *therapeuein*, to attend, from *θεράπων*, *therapōn*, attendant). The name of an ascetic sect described by Philo Judæus in his treatise *On the Contemplative Life*. There were groups of this sect in the various nomes of Egypt, and elsewhere, but Philo especially depicts the life of some of these "servants of God and physicians of the soul" who were settled in *μοναστήρια*, *monastēria*, on the shores of Lake Mareotis south of Alexandria. In their cells, to which no food or drink was brought, they devoted themselves to solitary contemplation and allegorical interpretation of the Scriptures. They had common meals in the evening, a religious service on the Sabbath, and a great festive meal on the 50th day. Eusebius thought that Philo described Christian monks, and this view was still held by Montfaucon. Grätz, Lucius, Hilgenfeld, Schürer, and others have regarded the work as spurious and as an early description of Christian monasticism. Recently, however, the preponderance of scholarly opinion is in favor of Philonic authorship and the real existence of the Jewish sect of the Therapeutæ. The arguments have been presented with great force by Massebieau, Conybeare, and Wendland. Even Bréhier, who feels that the question cannot be decided absolutely, concludes that "one can, without contradiction, ascribe to Philo a eulogy of the Therapeutæ." Consult the French translation by Montfaucon, *Le livre de Philon de la vie contemplative* (Paris, 1709); and the English translations by Yonge, *The Works of Philo Judæus* (London, 1854–55), and by F. C. Conybeare, in *The Jewish Quarterly Review*, vol. vii (ib., 1895); also H. Grätz, *Geschichte der Juden* (2d ed., Leipzig, 1863); A. Lucius, *Die Therapeuten und ihre Stellung in der Geschichte der Askese* (Strassburg, 1880); A. Hilgenfeld, in *Zeitschrift für wissenschaftliche Theologie* (Jena, 1880); A. Massebieau, "Le traité de la vie contemplative et la question des Therapeutes," in *Revue de l'histoire des religions*, vol.

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THER'APEU'TICS (from Gk. *θεραπευτικός*, *therapeutikos*, relating to medical treatment, from *θεραπευτής*, *therapeutēs*, attendant, servant). The branch of medicine which has as its object the cure of disease. The conception of disease which is found among primitive races is associated with the idea of demon possession. The earliest therapeutic measures were devoted to driving out these demons from the bodies of their victims. Two methods were employed: one consisted in the recital of charms or magic over the ailing part, or over the sick person; and the other consisted in internal administration or external application of certain aromatic or bitter herbs. In the early history of both Eastern and Western nations there was a blending of the office of priest and physician. Among the ancient Egyptians the treatment of disease had acquired a character by no means unscientific. They used remedies of vegetable, mineral, and animal nature, many of acknowledged value. Careful directions as to administration of drugs and indications for their use have been found. Egyptian physicians' knowledge of hydrotherapy, dietetics, and hygiene was far advanced. Among the Hebrews the infliction and cure of diseases is on various occasions in Scripture ascribed to the direct interposition of God. Their methods of treatment consisted principally of strict hygienic means, attention to diet, ablution, separation, and combustion of infected garments. A large list of remedies is mentioned in the Bible. The Babylonians had no practitioners of medicine; they exposed their sick in public places in order that travelers might help as to the best mode of cure. In Assyria the sick were similarly exposed, and purges, emetics, and blisters were employed for three days successively each month. We know that they used salt and alum, as well as fumigations with mixtures of various drugs. The Chinese assert that with them the study of medicine was coeval with the foundation of their empire. They possess works on treatment of great antiquity. Ginseng they regarded as a panacea, and also employed opium, mercury, and many other drugs of value. The Greeks may have borrowed something from the Eastern nations of their knowledge of medicine and treatment; but researches have shown that under the scientific spirit of Hippocrates they had evolved a fairly good system. Hippocrates ascribed disease to alterations of the humors of the body (the blood, phlegm, and yellow and black bile). He employed baths, diet, exercise, blood-letting, the actual cautery, and an extensive series of medicines. The Alexandrian school, which succeeded the Hippocratean, opposed bleeding and returned to simple remedies. This sect was followed by the Empiricists, who followed experience as their sole guide. Then came the Methodic school, which explained all normal and abnormal processes by the contraction and relaxation of the pores of the body. They regarded all medicines as possessing astringent or relaxant qualities, and chose remedies for one of these effects. Galen represented the highest development of Greek medicine. He explained the operation of drugs by reference to their elementary qualities, heat, cold, dryness, and moisture. In the early periods of Roman history medicine was practiced by the slaves and freedmen and its highest development was reached under the influence of the Greek school. In the Dark Ages medicine was practiced by the monks. Magic and astrology were potent influences. During this time the doctrine of "signatures" arose. According to this idea a remedy was chosen on account of its fancied resemblance in form or color to the organ affected. To this doctrine we trace the introduction into medicine of such drugs as the bloodroot and liverwort. The old Galenists used only organic drugs, but in the fifteenth century under Paracelsus and his followers there was an overthrow of the older methods. He first introduced chemical agents (employing mercury in syphilis) and substituted tinctures, essences, and extracts for various disgusting preparations. Towards the middle of the eighteenth century the practice of therapeutics had reached a most complicated stage. There were theories and countertheories and physicians were prescribing huge doses of unpleasant mixtures in the hope of securing good from all the remedies recommended. A natural reaction set in which resulted in the establishment of homœopathy, an outgrowth of the reactionary doctrine of vitalism. Later there arose the therapeutic nihilists, prominent among whom were Van Swieten and Skoda. This school rejected drug treatment.

Modern therapeutics may be said to have begun with the discovery of morphine, an alkaloid of opium, in 1817. The present method of treatment is embodied in rational therapeutics, which implies the use of remedies based on a knowledge of the diseased condition present in the patient, a knowledge of the nature of disease itself, and of the physiological action of the agent employed, as determined by experimental investigation on animals, from which may be deduced the action on men. The knowledge of the action of drugs must include the manner in which they affect nerve centres, respiration, circulation, and especially their influence on blood pressure and on body temperaature. The range of medicinal doses, as well as the minimum and maximum fatal doses, must also be determined. In treating disease it is the aim of the physician to seek the cause of the condition present and to endeavor from a true appreciation of the knowledge of drug action to administer curative remedies. A remedy which will usually cure a certain disease is called a specific. Such is the action of mercury and salvarsan in syphilis, and quinine in malaria. Empirical therapeutics was based on the cumulative evidence that certain drugs were of service in certain conditions, and experiment was the sure guide. Symptomatic treatment aims to relieve the symptoms of disease irrespective of their cause. Rational or scientific therapeutics recognizes that both these previous methods may have to be followed at times, but it aims especially at the removal of the cause of disease by appropriate treatment of whatever sort. It has been developed by the increased knowledge of disease which we have acquired through the growth of the sciences of pathology and bacteriology. *Materia medica* comprises a knowledge of the remedies employed in medicine; while the methods by which drugs are prepared and combined for administration, as well as the separation of the active principles of drugs, belongs to the department of therapeutics known as pharmacy. It is essential that there should be a uniform standard of strength and purity of medicinal products, as well as uniformity in their preparation, and to attain this object the various countries have standards established by law or by professional authority, to which the drugs prepared by the pharmacists must conform. These standards are published by each nation in works known as *Pharmacopœias*. The first United States *Pharmacopœia* was published in 1820, previous to which time European works were mainly used as authorities. This work is revised every 10 years by a committee of physicians and pharmacists. Those preparations which follow its direction and are named in the work are called official. Unofficial preparations, including many newer drugs, are in use. The best of these are finally included in the *Pharmacopœia* (q.v.), provided they are regarded of sufficient value.

The term "therapeutics" is usually restricted to the administration of medicinal drugs, but in its broadest sense, general therapeutics, it includes every form of treatment. Natural therapeutics is the healing power of nature to cure disease through the operation of the so-called *vis medicatrix naturæ*. In what is known as expectant treatment the physician depends solely on this force and sustains the patient's strength by food and nursing. Treatment by surgical means is regarded as a special and separate department of medicine. A large number of other means than treatment by drugs are in use and each is designated by an appropriate prefix. Electrotherapeutics, the use of electricity as a healing agent, is especially valuable in certain cases of disease of the nervous system or local injury to a nerve. By this means nutrition of paralyzed muscles may be maintained by electrical stimulation until the nerve is in a condition to resume its function. Radiotherapy or X-ray therapy is the use of the Röntgen rays for the purpose of treatment. Hydrotherapy is treatment by the application of water, either as baths of various temperatures (balneotherapeutics) or by drinking, douching, spraying, etc. Suggestive therapeutics, a branch of mental therapeutics, is the name given to treatment in the form of suggestion made to the patient while in an induced hypnotic state, with the object of the patient's following the suggestion when out of the hypnotic state. This treatment is of limited utility in a few varieties of nervous disease of so-called functional origin, in which no organic disease exists. Climatotherapeutics is the utilization of certain locations on account of their peculiar adaptability to the patient's condition; as the sending of patients suffering with consumption to great altitudes and dry climates. Thermotherapeutics is the treatment of disease by the application of heat. Therapeutics fully recognizes the value of diet in disease in an important department of the subject known as dietetics or dietotherapeutics. The use of extracts of various glands of the body, especially of the thyroid and the suprarenal glands, has attracted considerable attention. This department of therapeutics is called opotherapy or organotherapy. Massage and various allied measures have a prominent place in the treatment of certain conditions and assist in sustaining the nutrition of the muscles. This is sometimes called mechanical therapeutics or mechanotherapy (q.v.). See also the separate articles under the different forms of therapeutics enumerated here.

There have been a number of methods of classifying remedies followed by various authorities, but none of these is entirely satisfactory. The most important are: (1) the botanical method, which groups the vegetable remedies according to the botanical classifications; and (2) the arrangement according to the therapeutic action of drugs. Many drugs, however, are used for a number of purposes, and it is undesirable to describe them under more than one heading. Finally, there is (3) the pharmacological classification, which arranges drugs according to their action on living matter. This method does not take into account the chemical composition or therapeutic action of drugs, but those having the most characteristics in common are placed together. The groups are named for the most prominent member or from some marked property possessed by all. Consult: H. A. Hare, *Modern Treatment* (2 vols., Philadelphia, 1910–11); Frederick Forchheimer, *Therapeusis of Internal Diseases*, edited by Billings and Irons (2d ed., 5 vols., New York, 1914); H. A. Hare, *Textbook of Practical Therapeutics* (15th ed., Philadelphia, 1914); A. R. Cushny, *Textbook of Pharmacology and Therapeutics* (6th ed., ib., 1915). See PSYCHOTHERAPY.

THERE'SA, SAINT. See TERESA.

THERESINA, tā'rē-zē'nȧ, or **THEREZINA**. The capital town of the State of Piauhy, Brazil, on the right bank of the river Parnahyba, 220 miles from the city of that name at its mouth (Map: Brazil, J 5). The town is a commercial centre of some importance. Pop. (est.), 30,000.

THERESIOPEL, tā-rā'zē-ō'p'l, or MARIA-THERESIOPEL (Hung., *Szabadka*). A royal free city of the county of Bács, Hungary, 109 miles by rail south-southeast of Budapest (Map: Hungary, F 3). It is a scattered town, lying in a great, rich plain between the Danube and the Theiss, and has noteworthy churches. Theresiopel is the centre of a fine large corn-raising district, which also produces tobacco. The manufactures include linens and shoes. The town has a fine trade in grain, wine, horses, cattle, hogs, hides, and wool. Pop., 1900, 82,122; 1910, 94,610.

THE'RIA. See EUTHERIA.

THER'IDI'IDÆ (Neo-Lat. nom. pl., from Gk. *θερίδιον*, *theridion*, dimin. of *θήρ*, *thēr*, wild beast). A family of spiders known as the cobweb weavers. These are small spiders with very slim legs, and include most of the familiar house spiders. They are generally soft and of a light color, with the abdomen large and round and the legs lacking in spines. The eyes are all of about the same size and are placed in two rows across the front of the head. The mandibles are weak and without teeth at the end. The maxillæ are pointed at the end and turn inward toward each other. The family is one of the largest of the order Arachnida. Many species of Theridiidæ spin their webs in the fields on bushes. The web is a flat or curved sheet, supported by threads which run in many directions, under which the spider hangs head downward. The egg cocoons are round and soft and hang in the web.

THE'RIODON'TA (Neo-Lat. nom. pl., from Gk. *θηρίον*, *thērion*, dimin. of *θήρ*, *thēr*, wild beast + ὀδούς, *odous*, tooth). An order proposed by Owen to include the mammal-like reptiles with mammal-like teeth, from the South African Karrov formation. The group has since been subdivided, the Lower Permian types forming the Therocephalia, the Upper Triassic forms being placed in the order Cynodontia.

THE′RIOSU′CHUS (Neo-Lat., from Gk. θηρίον, *thērion*, dimin. of θήρ, *thēr*, wild beast + σοῦχος, *souchos*, crocodile). An extinct crocodile with body less than two feet long, skeletons of which are found in the Purbeck beds of the English Upper Jurassic. See Crocodile; Teleosaurus.

THERMÆ, thẽr′mē. The Latin term, used also in English, for a Roman bathing establishment. While the earlier thermæ were comparatively modest in size, those built by Agrippa (27 B.C.) and by the emperors Titus, Trajan, Caracalla, Diocletian, and Constantine, were of immense size and complexity. They were all of one general type, comprising a central block flanked by courts, set upon an immense terrace built on vaulted supports. Besides the *frigidarium* or cold plunge, the vast vaulted *tepidarium* or warm bath, the *caldarium* and *sudatorium*, hot vapor chambers, the courts with dressing rooms and long rows of smaller bath chambers, they provided also gardens, stadia, halls for clubs and lectures, and many other features for exercise and recreation. The largest was that of Caracalla, accommodating 3600 bathers at once; its ruins are the most imposing in Rome with the possible exception of the Colosseum. The baths of the Forum and the Stabian thermæ at Pompeii are well preserved and very interesting, though of small size. The tepidarium of the thermæ of Diocletian at Rome is now the church of Sta. Maria degli Angeli. See Bath; Roman Art.

THERMÆ ANTONINIANÆ. See Bath.

THERMÆ HERCULIS. See Mehádia.

THERMÆ HIMERÆÆ, or **HIMERENSES.** See Himera.

THERMÆ TITIANÆ. See Titus, Baths of.

THERMÆ TRAJANÆ. See Trajan, Baths of.

THERMAL SPRING (from Gk. θέρμη, *thermē*, heat, from θερμός, *thermos*, hot). A spring whose temperature is higher than the average temperature of the locality in which it emerges. The temperature may vary therefore from a minimum of a few degrees above the freezing point, which, however, is limited to thermal springs in high altitudes or great elevations, to a maximum represented by the boiling point of water under the local conditions. When the temperature reaches the latter limit the flow of the spring may take the form of periodical eruptions; a thermal spring of this character being known as a geyser (q.v.). The higher temperature of thermal springs as compared with ordinary springs may be caused by volcanic agencies or by the circulation of the waters at great depths in the earth's crust previous to emergence. The hottest springs are usually found in volcanic regions, their high temperature due to coming in contact with uncooled lava, which, buried at some depth, long retains its heat. It seems probable, also, that some springs are heated by gaseous emanations from the earth's interior, or, indeed, receive material contributions from that source. Thermal springs are common in districts that have been free from volcanic disturbances, at least since remote geological times. Such increase in temperature can best be explained by peculiarities of geological structure which permit the surface waters to descend to great depths when heated and thence return to the surface under the influence of hydrostatic pressure. See Spring.

THERMES, târm (Fr., from Lat. *thermæ*, warm baths). The only remains of the Roman palace which occupied the site of the present Hôtel de Cluny, Paris. The ruins are those of the great baths connected with the palace, and include a frigidarium 65 feet long and 59 feet high, still uninjured, although up to 1820 it had long borne the weight of a garden laid out over it. The ships' prows of the vaulting are said to be the origin of the arms of Paris. A collection of Roman antiquities discovered in Paris is preserved in the hall.

THERMIC (thẽr′mĭk) **FEVER.** See Heat Stroke.

THERMIDOR, *Fr. pron.* târ′mē′dōr′ (Fr., from Gk. θέρμη, *thermē*, heat + δῶρον, *dōron*, gift). The eleventh month in the French revolutionary calendar. It extended from July 19 to August 18 in the years I–VII and from July 20 to August 19 in the years VIII–XIII. The 9th Thermidor of the year II (July 27, 1794) is historically memorable as the date of Robespierre's fall and the termination of the Reign of Terror. The name "Thermidorians" was given to all those who took part in this coup d'état, but more particularly to those who were desirous of restoring the monarchy. See French Revolution; Robespierre.

THERMIT, thẽr′mĭt. See Alumino-Thermics; Welding.

THERMOBAROMETER. See Hypsometer.

THERMOCHEMISTRY. The branch of general chemistry that deals with the thermal phenomena accompanying chemical transformations. Since the phenomena in question are caused partly by the chemical changes proper, but partly also by the purely physical changes of state that often accompany chemical reactions, the scope of thermochemistry must extend over physical as well as chemical changes of matter. For the principles of thermochemical notation, see Chemistry, *Transformations.*

What has thus far been accomplished in the domain of thermochemistry may be summed up as follows: First, a large number of transformations have been subjected to calorimetric measurement, and so the total amounts of heat given off or absorbed during a great many changes have been determined experimentally; secondly, the principles of thermodynamics have been successfully applied to the consideration of chemical changes, and thus thermochemistry has been highly developed theoretically.

Experimental Thermochemistry. The actual execution of thermochemical measurements is a matter of some difficulty, owing to the considerable errors that may be caused by more or less heat being lost by radiation while the measurement is being carried out. The heat given off or absorbed is determined by keeping the vessel in which the reaction takes place immersed in a known quantity of water, and observing the temperature of the latter before and after the reaction. In recent years Richards and other experimenters have sought altogether to eliminate loss of heat through radiation, by keeping the vessel surrounding the calorimeter at the same temperature as the calorimeter itself (adiabatic calorimetry). But whatever the details of the calorimetric arrangement many reactions would remain inaccessible to thermochemical investigation if it were not for the fact that early in the history of thermochemistry a principle became known that permitted of ascertaining the heat reactions by indirect methods. The principle in question is known as the law of constant heat sums. While clearly established by Hess in 1844, i.e., before the law of the conservation of energy became known, it is nothing but a special form of the law of conservation. It is as follows: The amount of heat given off or taken up when a given chemical system is changed into another is the same whatever the steps in which the change may take place. Let, e.g., the given chemical system consist of 17 grams of gaseous ammonia in one vessel, its equivalent 36.5 grams of gaseous hydrochloric acid in another vessel, and a large quantity of water. This system may be changed into a dilute aqueous solution of ammonium chloride in two different ways: (1) ammonia and hydrochloric acid may be caused to combine in the gaseous state, yielding solid ammonium chloride and developing 42,100 calories of heat; then the ammonium chloride may be dissolved in the water—a change accompanied by the absorption of 3900 calories; or (2) the gaseous ammonia may be dissolved in a large amount of water—a process developing 8400 calories; the gaseous hydrochloric acid may be dissolved in a separate large quantity of water—a process developing 17,300 calories; and finally, the dilute aqueous ammonia may be mixed with the dilute aqueous hydrochloric acid—a process developing 12,300 calories. Whichever the way adopted, the result is the same—viz. a dilute aqueous solution of ammonium chloride. The heat developed when the first way is adopted is 42,100 − 3900 = 38,200 calories; the heat developed when the second way is adopted is 8400 + 17,300 + 12,300 = 38,000 calories. The figures 38,200 and 38,000, differing by only 2 parts in 382 (little more than ½ per cent), i.e. by less than the unavoidable experimental error, must be considered as equal—which is in accordance with the law of constant heat sums. If, for some reason, it were impossible directly to measure, say, the heat produced by the combination of gaseous ammonia and gaseous hydrochloric acid, that heat might be calculated, according to the law of constant heat sums, by adding 3900 calories (the heat absorbed when one equivalent of ammonium chloride is dissolved in much water) and 38,000 calories (the total heat produced during the transformation, by the second way, of gaseous ammonia and hydrochloric acid into dilute ammonium chloride). The sum, 41,900 calories, would be as near the truth as the 42,100 calories found by direct experiment.

To take another, even simpler example, suppose it were asked, How much heat would be evolved or absorbed in the transformation of 12 grams of amorphous carbon into diamond? The transformation, although accomplished on a minute scale by Moissan, in his electric furnace, is of course inaccessible to direct calorimetric measurement. But the law of constant heat sums permits of answering the question by measuring the heat of combustion of amorphous carbon and that of diamond. The transformation of amorphous carbon into carbon dioxide, whether accomplished by direct combustion or by first changing the carbon to diamond and then burning the latter, must be accompanied by the evolution of the same amount of heat, viz. 97,650 calories; and as the heat of combustion of diamond is 94,310 calories, the transformation of amorphous carbon (12 grams) into diamond must, according to the law of constant heat sums, be accompanied by the evolution of 97,650 − 94,310 = 3340 calories.

In a similar manner Hess's law permits of ascertaining the heat that would be developed during the formation of compounds (e.g. the majority of organic compounds) whose formation from the elements could not be directly studied calorimetrically. Let it be required, i.e., to ascertain the heat that would be developed or absorbed if ordinary alcohol (C_2H_6O) were made from its elements—carbon (in the form of diamond), hydrogen, and oxygen. To do this, we may determine calorimetrically the heat (call it *a*) developed by the combustion of one gram molecule of alcohol and the heats of combustion (*b* and *c*) of quantities of isolated carbon (diamond) and hydrogen equal to those contained in one gram molecule of alcohol. The three combustions may be represented by the following equations:

$$C_2H_5OH + 6O = 2CO_2 + 3H_2O + a \text{ calories};$$
$$2C + 4O = 2CO_2 + b \text{ calories};$$
$$3H_2 + 3O = 3H_2O + c \text{ calories}.$$

Adding the second and third equations, we get:

$$2C + 3H_2 + 7O = 2CO_2 + 3H_2O + b + c,$$

and subtracting the first equation from this, we get:

$$2C + 3H_2 + O - C_2H_5OH = b + c - a,$$
$$\text{or}\quad 2C + 3H_2 + O = C_2H_5OH + b + c - a.$$

This last equation, expressed in words, means that if carbon, hydrogen, and oxygen combined to form ordinary alcohol, an amount of heat would be formed equal to the heat of combustion of the isolated elements of alcohol minus the heat of combustion of alcohol itself; *b*, the heat of combustion of two atoms (i.e., twice 12 grams) of carbon is found to be 94,300 × 2 = 188,600 calories; *c*, the heat of combustion of three molecules (i.e., 3 × 2 grams) of hydrogen is found to be 67,500 × 3 = 202,500 calories; finally, *a*, the heat of combustion of one molecule (46 grams) of alcohol, is found to be 340,000 calories. Hence, $b + c - a$, the heat of formation of alcohol, is 188,600 + 202,500 − 340,000 = 51,100 calories. See COMBUSTION.

Theoretical Thermochemistry. This, as already stated above, consists in the application of the principles of thermodynamics to chemical phenomena. The subject, though not very difficult, requires a working knowledge of higher mathematics and thermodynamics, and can therefore be discussed here only in its more elementary aspects. The principal questions to which thermodynamics has been applied concern: (1) the influence of temperature upon the total energy change of reactions, i.e., heat given off or absorbed, no mechanical work being performed; (2) the influence of temperature upon the velocity of reactions (see REACTION, CHEMICAL); (3) the influence of temperature on chemical equilibrium; (4) the determination of the maximum mechanical work that can be performed by the chemical energy of reactions. We will briefly consider these questions in order.

With reference to the dependence of the energy change of a reaction upon the temperature, the verdict of thermodynamics is, first of all, that in case the heat capacity of the reacting substances is the same as that of the products of the reaction, the energy change of the reaction does not vary with the temperature. This is generally the case when the reacting substances and the products of the reaction are all solids. Thus the combination of silver and solid iodine into silver iodide sets free practically the same amount of heat (about 14,000 calories), no matter at what temperature the combination is caused to take place. On the other hand, if a given reaction does cause a change in the heat capacity, then, if t denotes the difference between two temperatures at which the reaction may take place, $u_1 - u_2$ the difference between the energy change at the first and that at the second temperature, and c the difference between the heat capacity of the reacting substances and that of the products of the reaction,

$$u_1 - u_2 = ct.$$

By measuring calorimetrically the heat capacities in question and the energy change of the reaction at some one temperature, it is therefore easy to calculate the energy change of the reaction at any other temperature—a result of considerable importance, because direct calorimetric measurement of the energy change can by no means be readily carried out at any desirable temperature.

As to the velocity of reactions (see REACTION, CHEMICAL), it is well known that rise of temperature causes the velocity of reactions to increase with great rapidity. Usually a rise of 10° C. doubles or even trebles the velocity. In a perfectly general manner, however, the dependence of the velocity on temperature cannot as yet be formulated. Van't Hoff has succeeded in showing that in many cases the dependence of reaction velocity on the temperature can be expressed by simple equations of the following form:

$$\log k = -\frac{A}{T} + B,$$

an equation established by him by combining the principles of thermodynamics with experimental observations. In this equation k stands for the velocity at the instant when the product of the active masses equals unit; T stands for the absolute temperature (i.e., the centigrade temperature plus 273 degrees); and A and B are constants whose numerical values depend on the nature of the substances taking part in the reaction. If k is actually measured at only two different temperatures, and its two corresponding values (say k and k_2), together with the two temperature numbers (say T_1 and T_2), are substituted in the above equation, we get:

$$\log k_1 = -\frac{A}{T_1} + B,$$

$$\log k_2 = -\frac{A}{T_2} + B,$$

two equations with two unknowns, A and B. Solving these equations, and substituting the resulting numerical values of A and B in the general equation given above, we obtain a general relation between k and T for the given reaction. In other words, we can readily calculate what may be termed the standard velocity for any temperature whatever—the standard velocity being the velocity at the instant the concentrations of the reacting substances are such that the product of their active masses equals unit. The law of chemical mass action then permits of calculating the reaction velocity for all other possible concentrations.

With reference to chemical equilibrium (see REACTION, CHEMICAL), thermodynamics, as Van't Hoff has shown, permits of foreseeing the equilibrium of a reaction at some temperature T_2, if the equilibrium at some given temperature T_1 and the average of the energy changes (heats given off or taken up by the reaction) at the two temperatures are known. In this manner it is possible to calculate, i.e., the degree of dissociation of ammonium chloride (see DECOMPOSITION; DISSOCIATION) at different temperatures, if the degree of dissociation at some one temperature, and the heat of dissociation, are known. In connection with the influence of changes of temperature on chemical equilibrium, it is necessary to mention also Gibbs's *Phase Rule*, which is of great importance in classifying the phenomena of equilibrium in material systems. See PHASE RULE.

One more important application of thermodynamics to chemical phenomena has been made and requires mention. Thermodynamics, in studying a transformation of some material system, endeavors to ascertain the maximum mechanical work that might be produced by the transformation, the maximum work meaning the work that might be obtained by the use of some ideal mechanical device, frictionless and permitting, so to speak, of no leakage of energy. The importance of knowing this maximum of work is great. Any natural change taking place of itself—whether it be the falling of a stone, expansion of a compressed gas, combustion of coal, or any other change, mechanical or chemical—may be used to produce mechanical work; and no material system is capable of changing unless it possesses the capacity for producing work—or, as Helmholtz terms it, free energy. In other words, it may be said that it is because a system can produce mechanical work that it is capable of changing spontaneously. The burning of coal (i.e., the chemical transformation of the system, carbon and oxygen), once started, can go on of itself because it can be used to produce mechanical work, or, what is the same, because the system carbon and oxygen possesses a certain amount of free energy. When, therefore, the free energy of a system has been used, without loss, to produce mechanical work, and that work has been measured, we have a measure of the cause of the given transformation. The cause of chemical transformations is generally termed chemical affinity. Obviously, then, the maximum work that can be produced by a chemical transformation is a measure of the chemical affinities involved in it, and this is why the determination of maximum work has great importance for chemical theory. But it may also be valuable for purely practical purposes. Take, e.g., again the combustion of coal. It is well known that steam engines are very wasteful of energy. In connection with the problem of a more economic use of coal the question must naturally arise, How much mechanical work could possibly be obtained altogether by burning a certain amount of coal, supposing that an ideally perfect device were employed for the purpose? The direct measurement of the maximum work, although theoretically possible, could not be actually carried out.

But the maximum work of a reaction can be readily calculated, with the aid of thermodynamics, if the concentrations of the reacting substances and their products, when in the state of chemical equilibrium, are known. In the case of the combustion of coal the equilibrium concentrations have been determined by indirect measurement, and on the basis of this Nernst has calculated approximately the maximum work of the combustion for three different temperatures: If 12 grams of carbon were burned at the absolute zero of temperature (— 273° C.), the equivalent of 97,650 calories might be obtained; at 18° C. the maximum work would be equivalent to 91,470 calories; at 1000° C. the equivalent of only 70,625 calories can be obtained; this in spite of the fact that the heat given off by the combustion is practically the same at all temperatures, viz., 97,650 calories. Only at the absolute zero of temperature could the heat produced by the combustion of coal be entirely transformed into mechanical work.

In conclusion, a few words must be said with reference to an erroneous principle that has gained somewhat wide acceptance among chemists, viz., Berthelot's principle, according to which it is the heat produced by a reaction, and not the maximum possible mechanical work, that measures the cause of the reaction; and of two reactions that might take place in a given system, the one accompanied by the greatest evolution of heat must necessarily take place. This principle holds good often, but not always, and so cannot be looked upon as a law of nature. The most important argument against it is that, were it unlimited in its application, as Berthelot claims it to be, reversible reactions would be impossible; for one of a pair of reversible reactions not only does not develop heat, but necessarily absorbs heat; and hence, if Berthelot's principle were correct, that reaction could not take place at all, and its opposite reaction would be complete. (See REACTION, CHEMICAL.) An exceedingly promising attempt to explain the facts that led Berthelot to the formulation of his principle has in recent years been made by Nernst (see NERNST'S HEAT THEOREM); but this matter cannot be discussed in the present article.

The principal names connected with experimental thermochemistry are those of Hess, Julius Thomsen, Berthelot, Stohmann, and, perhaps, Richards. The first to apply the principles of thermodynamics to chemical phenomena was Horstmann. The problem was next taken up by Willard Gibbs, of Yale University, whose thorough and original treatment of the subject remained unknown for a number of years. The importance of Van't Hoff's thermochemical work may be readily seen from the present sketch. Finally, Le Chatelier, Planck, Riecke, and Duhem have made noteworthy contributions to the mathematical treatment of the subject.

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THERMOCOUPLE, THERMOPILE. See THERMOELECTRICITY.

THER'MODYNAM'ICS (from Gk. *θέρμη*, *thermē*, heat + *δύναμις*, *dynamis*, power). The application of the principles of mechanics to heat phenomena. It is shown in the article HEAT that all heat effects can be traced for their cause to work having been done against the molecular forces of the body—e.g., friction, compression, etc.—or to the reception of energy by the minute portions of the body—e.g., radiation, conduction, etc. In short, it may be regarded as proved experimentally that heat effects always accompany changes in the intrinsic energy of a body; and the idea that the numerical value of the heat effects depends on the energy added to the minute portions of the body and on that alone is now accepted by every one. If a small amount of energy ΔQ is added to a body, its intrinsic energy is changed (dU) and as a rule a certain amount of external work is done by the expansion of the body (pdX, where p is the external pressure on the body and dV is the change in volume). By the conservation of energy, then, if no other work is done,

$$\Delta Q = dU + pdV.$$

This is sometimes called the first principle of thermodynamics. If the external work is of other form than that due to expansion, e.g., if it is electric work, the first principle may be written

$$\Delta Q = dU + \Delta W.$$

In any form of heat engine—e.g., a steam engine—the working substance, water, starts at ordinary temperature; heat energy is added to it by the boiler; it reaches a high temperature, that of the boiler, and a high pressure; it expands, doing work in pushing out the piston; its temperature and its pressure therefore fall; the cylinder is now joined to the condenser, and the steam passes out and is condensed to water, giving up heat energy; the piston is drawn back and the process is repeated. So far as the heat energy and work are concerned, heat energy (Q_1) at a high temperature has been given to the working substance, heat energy (Q_2) at a low temperature is taken away from it, external work (W) is done. By the first principle of thermodynamics $W = Q_1 - Q_2$, since the water at the end of its cycle of changes has the same energy that it had at the beginning, provided its temperature and volume are the same. The efficiency of the process is defined as the ratio $\frac{W}{Q_1}$ or $\frac{Q_1 - Q_2}{Q_1}$. In considering the efficiencies of various processes, Sadi Carnot in 1824 was led to imagine one which bears his name and which can be discussed theoretically. This process is one which consists of a working substance inclosed in a cylinder with a movable piston passing around a cycle so as to return to its initial condition. There are supposed to be two large reservoirs of a liquid, at different temperatures. The cylinder containing the working substance at a high pressure and small volume is imagined placed in the high-temperature tank; the substance is allowed to expand, so slowly that its temperature remains practically unchanged at that of the surrounding liquid in the tank; in doing this, heat energy must flow into the working substance, otherwise its temperature would fall; after the volume has increased sufficiently, the cylinder is removed from the tank, and the inclosed substance is allowed to expand under such conditions that no heat energy can enter, and its temperature falls; when it reaches that of the second tank the cylinder is placed in it, the piston is forced in by external force, thus reducing the volume; if this process is done slowly the temperature will not rise, but heat energy will flow out into the liquid of the tank; when the volume is sufficiently reduced, the cylinder is removed and the piston is pushed in under such conditions that no heat energy can leave or enter; if the volume at the beginning of this last step is chosen correctly the working substance will after a sufficient compression be restored to its original condition. There have been four steps, two isothermal and two adiabatic. The net result is: No change in the working substance; external work (W) done by the substance; heat energy Q_1 withdrawn from the high-temperature tank; heat-energy Q_2 given out to the low-temperature tank. Therefore, by the first principle of thermodynamics,

$$W = Q_1 - Q_2.$$

This process of Carnot's is perfectly reversible; by doing an amount of work W on the working substance it may be made to pass around the cycle in the reverse way; the low-temperature bath losing an amount of heat energy Q_2 and the high-temperature bath gaining an amount Q_1. The conditions for reversibility are that each point of the whole cycle should be one of equilibrium; and it is apparent that for this to be satisfied the changes must all be made slowly, and that when the substance receives or gives out heat energy it must be in contact with a large tank of liquid at the same temperature, within an infinitesimal amount, as it itself is at that instant. (If a gas expands out of a high-pressure reservoir into the open air—e.g., illuminating gas rushing out of a burner—the process is irreversible; if in an engine the flame is at a higher temperature than the steam in the boiler—as it always is—the process is irreversible.) It was stated by Carnot that the efficiency of his process, $\frac{W}{Q_1}$, was the same for all working substances and depended alone on the temperatures of the two baths. His proof was, however, erroneous, and was corrected by Clausius in 1850, who showed that the statement was correct if one assumed that heat energy of itself always passes from high to low temperature. This is in accord with all our experiences of nature; thus, if a hot and a cold body are left free to radiate or to conduct to each other, the former always becomes colder and the latter warmer. The statement that heat energy of itself does always pass from high to low temperature is called the second principle of thermodynamics. Lord Kelvin has shown that this principle is identical in its conclusions with the assumption that it is impossible by any material agency to derive mechanical effect from any portion of matter by cooling it below the temperature of the coldest of the surrounding objects.

Since $\frac{W}{Q_1}$ is a function of the temperatures of the two tanks alone, it is possible to give such numbers to the temperatures of these tanks as will be independent of the working substance (i.e., thermometric substance). Lord Kelvin—then William Thomson—suggested that the numbers T_1 and T_2 be so chosen for the temperatures of the tanks that $\frac{T_1}{T_2}=\frac{Q_1}{Q_2}$. In this case $\frac{T_1-T_2}{T_1}=\frac{Q_1-Q_2}{Q_1}=\frac{W}{Q_1}$ and is therefore independent of everything except the temperatures. T_1-T_2 may be given any arbitrary value, e.g., 100; then the number T_1 for the temperature of the hot bath is determined by performing a Carnot's process, using any working substance. All other thermometric systems depend upon the selection of the thermometric substance, and no two systems would in general give the same numbers for the same temperature. Thus the great scientific advantage of Thomson's absolute scale is seen. It is found by direct experiment that if $T_1 - T_2$ is chosen as 100 for two tanks of melting ice and boiling water, the numbers on Thomson's absolute scale are almost exactly the same as obtained in a gas thermometer using the absolute centigrade scale. See THERMOMETRY.

Since the efficiency increases as T_2 becomes smaller, and since the efficiency cannot be greater than unity, there must be a minimum temperature in the universe. This is known as the absolute zero; its value is about $-273°$ C., as shown by the agreement between the two absolute scales just described.

Carnot stated further that the efficiency of an irreversible process could not be greater than that of a reversible one with the two limiting temperatures of the tanks; and Clausius proved that this is true if the second principle of thermodynamics is true.

It is generally accepted that the efficiency of an irreversible process is less than that of a reversible one between the same two temperatures, but it cannot be regarded as a deduction from the two principles of thermodynamics. All processes in nature—chemical, electrical, etc.—are irreversible; and a natural system will therefore be in equilibrium if all imaginable processes compatible with the existing conditions necessarily involve an efficiency equal to or greater than that which corresponds to a reversible process.

Clausius made an interesting application of Carnot's principle and Thomson's definition of temperature. As defined above $\frac{T_1}{T_2} = \frac{Q_1}{Q_2}$, i.e., $\frac{Q_1}{T_1} = \frac{Q_2}{T_2}$; but in passing around a Carnot's cycle the heat added to the working substance is Q_1 and it is added while the body is at temperature T_1; no other heat is added; and the heat taken away is Q_2 while the body is at temperature T_2. If we call heat added positive, we must call heat taken away negative. Now, form the summation of the ratio $\frac{Q}{T}$ for the whole cycle. Along the higher isothermal this is $\frac{Q_1}{T_1}$; along both adiabatics it is zero (since $\Delta Q = 0$); along the lower isothermal it is $-\frac{Q_2}{T_2}$. Hence the sum is $\frac{Q_1}{T_1} - \frac{Q_2}{T_2}$; and by the above equation this sum is zero. Since it is possible to break up any cycle of operations into a series of Carnot's cycles, it is evident that the summation of $\frac{Q}{T}$ around any cycle equals zero; or, using the symbols of the calculus, $\int\frac{\Delta Q}{T}$ around a cycle $= 0$. The fundamental property of a cycle of operations is that the working substance returns to its former condition. So this equation signifies that $\frac{\Delta Q}{T} = d\phi$, where ϕ is a property of the body itself (just as are its temperature and its volume). This property was called by Clausius the entropy.

If two bodies at different temperatures are allowed to come to equilibrium, the hotter one will lose heat, thus having its entropy decrease, the colder one will gain heat, thus having its entropy increase. The decrease in entropy of the former is $\frac{\Delta Q}{T_1}$ while ΔQ passes from it to the colder body; and the gain in entropy of the latter owing to this passage is $\frac{\Delta Q}{T_2}$. But T_1, the temperature of the hot body, is greater than T_2, that of the cold body; hence considering the two bodies as a system there has been a gain in entropy. The same is true during any actual changes in nature, such as relative motion, which always involves friction, diffusion, etc. Clausius stated this by saying "the entropy of the universe tends to a maximum."

This fact has been given mathematical expression in a different form. If one introduces into Clausius' equation defining entropy the value of ΔQ as given in the first principle, the equation becomes $dU + pdV = Td\phi$. Apply this to a system of bodies which are in equilibrium with each other and with external conditions, i.e., there must be uniform temperature and uniform pressure within the system and without. Therefore, the above equation becomes $d(U + pV - T\phi) = 0$, where U, V, and ϕ are the values for the entire system. Now, if the system is not in equilibrium, but changes are going on, and if there is a constant temperature and a constant pressure on the outside of the system, it is not difficult to prove that $d(U + P_0V - T_0\phi) < 0$ where P_0 and T_0 are these external values. Thus, there is a function of the system, viz., $U + P_0V - T_0\phi$, such that under constant external conditions, if any internal changes occur, this function decreases. These changes will cease when the function reaches its minimum value. Such a function is called the thermodynamic potential at constant pressure and temperature. The importance of this principle in considering various chemical changes is evident. Gibbs, Planck, Duhem, and others have made brilliant use of it.

This function has another property which has been emphasized by Planck, and which justifies its other name "characteristic function." If the independent variables of the system are p and T, as they are in most experiments, it may be proved that, provided this function is known, all the thermodynamic properties of the system may be deduced from it.

In what has gone before it is seen that there are many properties of the system: its volume (V), its pressure (p), its temperature (T), its intrinsic energy (U), and its entropy (ϕ). Any two of these may be taken as independent variables; and depending on this selection, there is a definite characteristic function. Thus, if T and V are the variables, this function is $U - T\phi$, which plays an important part in the work of Helmholtz, and which he called the free energy.

It is clear from the definition of entropy given by Clausius, viz., $d\phi = \frac{\Delta Q}{T}$, that the absolute value of the entropy is not defined, only changes in its value. Therefore direct experiments cannot give the numerical value of the entropy for any body; but it is possible and allowable to assign a definite value to a body under definite conditions and to see whether this selection is justified by indirect experiments. This bold step was taken by Nernst (1906). What his theorem amounts to is to assume that "at absolute zero the entropy of every chemically homogeneous solid or liquid body has the numerical value zero." All the conclusions drawn from this have been found to be in accord with experiment. Two of these conclusions are that as the temperature is lowered continuously, both the specific heat and the coefficient of expansion of all solids approach zero values. Nernst himself has investigated the specific heats of 28 substances at the lowest temperatures available, and has shown that the specific heat approaches zero. Nernst has shown further that there is an important connection between his results on specific heats and Planck's quantum hypothesis as to the nature of radiation (q.v.). Debye (1912) made several modifications in Nernst's theory, and succeeded in deducing from Planck's equation for radiation a formula which gives the correct values for specific heats at low temperatures. One conclusion is that at such temperatures the specific heats of all solids is proportional to the cube of the absolute temperature.

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THERMOELECTRICITY. It was observed by Seebeck in 1822 that, if the two junctions of a closed metallic circuit made up of two different wires in series were at different temperatures, there was produced an electric current. As the difference of temperature at the junctions is increased, the current increases. It was shown, however, by Cumming in 1823, that for any temperature of one junction there is one for the other junction such that there is no current; this is known as the temperature of inversion. If in general, then, the temperatures of the junctions are made more and more different, the current increases, then decreases, becomes zero, and is finally reversed. The average of the temperatures of the junctions when the current is zero is called the neutral temperature, and is a constant for any two bodies.

These thermoelectric currents are due to molecular actions at the junctions and also throughout the conducting wires, owing to their nonuniformity of temperature. Where the two different metals join there are electric forces called the Peltier electromotive forces; while the electric forces through the conductors themselves are called Thomson electromotive forces. The existence of these electromotive forces is proved by forcing a current around a circuit by means of a battery or cell; at the junctions there is rise or fall of temperature, depending upon the direction of the current, showing a force opposing or helping on the current; similarly the conductor itself has its temperature raised or lowered, depending upon the direction of the current—quite apart from the usual heating effect of a current.

The properties of thermoelectric currents are best studied by diagrams. Some one metal is chosen as a standard; lead is generally selected because it has no Thomson effect. A circuit is made part of lead and part of another metal; one junction is kept at 0° C., and while the temperature of the other is varied continuously, both above and below zero the total electromotive force around the circuit is measured. These values of the E.M.F. for different values of the temperature of the variable junction are plotted in a curve, having E.M.F. for ordinates and temperatures for abscissæ. These curves when drawn for different bodies—all with reference to lead—are found to be approximately parabolas. Another form of diagram is made as follows: The junctions of the two metals, one of which is lead, are kept at temperatures T and $T + \Delta T$, where ΔT is a small quantity; the resulting E.M.F. around the circuit is measured, call it ΔE. The ratio $\frac{\Delta E}{\Delta T}$ is called the thermoelectric power; it is evidently a function of the temperature T, and when plotted on a diagram having temperatures as abscissæ, the curves are practically straight lines.

A thermocouple is one of the most sensitive instruments known for detecting differences in temperature. It can be improved by joining in a zigzag series several couples: first, a piece of bismuth, then one of antimony, then one of bismuth, etc., the first end of the first piece of bismuth and the last end of the last piece of antimony being joined by a wire passing around a galvanometer. Thus every other junction of bismuth and antimony is turned to form one face of the zigzag; and, if one face is at a higher temperature than the other, each couple helps the others, and thus a considerable current may be produced through the galvanometer. Such a combination of couples forms a thermopile. It was invented by Nobili in 1834.

Since the action of a thermocouple depends upon raising the temperature of one junction, it is evident that the sensitiveness of the instrument will be increased if the quantities of metal used at the junction are very small, so that in return for a small quantity of heat there will be a large rise in temperature. It will be increased still more if the instrument is in a vacuum so that the junction does not lose heat by convection currents. Applying these principles A. H. Pfund in 1913 constructed a thermocouple by means of which he was able to measure the radiation of heat from some of the fixed stars. See THOMSON EFFECT.

THER'MOHYDROM'ETER. See HYDROMETER.

THERMOM'ETER (from Gk. θέρμη, *thermē*, heat + μέτρον, *metron*, measure). An instrument for measuring temperature, but in early times erroneously supposed to measure heat. A brief account of the underlying theory and the history of thermometry are given under the title THERMOMETRY. This article will deal only with those forms of thermometers that are at present in ordinary use.

Air or Gas Thermometer. This form of the instrument is accepted as the standard and the indications of mercurial, alcohol, or other thermometers are all supposed to be corrected so as to agree with the standard adopted by the International Bureau of Weights and Measures at Paris. This standard consists of a hollow bulb of platinum filled with pure, dry hydrogen. When kept at a uniform pressure the volume of the gas expands in direct proportion to its temperature. By calling the volume at the melting point of ice V, and the volume at the boiling point of water $V + 100°$, we establish a scale of Centigrade degrees, which may be extended above or below these limits, so that, e.g., the temperature of the absolute cold or entire absence of heat would be −273° C. and the temperature of the boiling point of mercury would be about +357° C. Numerous precautions are needed in the use of the air thermometer, all of which are explained in the *Travaux et mémoires* of the International Bureau of Weights and Measures, and in Guillaume, *Thermométrie* (Paris, 1890). According to the theories of thermodynamics the peculiarities of platinum, hydrogen, or of any other materials that may be used, introduce small irregularities, so that the scale of equal changes of volume is not exactly proportional to the quantity of heat or the change in temperature. Therefore some recommend that a slight correction be applied to the hydrogen gas thermometer in order to obtain the ideal thermodynamic equivalent. The hydrogen gas thermometer at the present time, however, constitutes the fundamental standard, and all other forms are secondary in nature and their indications are ultimately corrected to give the gas scale of temperatures.

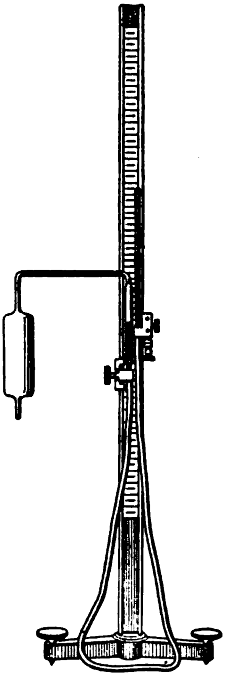


FIG. 1.
JOLY AIR THERMOMETER.

In Fig. 1 we see a simple or portable form of air thermometer, as arranged by Joly, for measuring temperatures below the boiling point of water. The large glass bulb on the left is filled with dry air, or dry hydrogen, and ends in a short vertical glass tube attached to the flexible rubber tube whose other end opens into another short glass tube, shown on the right-hand side, whose upper end is hermetically closed and constitutes the vacuum chamber of a barometric column of mercury. The glass bulb is immersed in a liquid or gas whose temperature is to be measured. If the volume of the inclosed gas expands with the higher temperature that is to be measured, then this expansion is counterbalanced by raising the vacuum chamber and the flexible tube on the right until the increased pressure of the mercury column compresses the expanding gas in the large bulb so as to keep it at a constant volume, which is indicated by the fact that the mercury in the left-hand tube just touches the tip of a fine glass point that is permanently fastened inside the tube. The pressure exerted by the mercurial column is measured by the difference in the level of the mercury in the right-hand and left-hand tubes. The scale for this measurement is graduated on a strip of mirror set into the vertical framework that supports the bulb and the tubes.

In Fig. 2 we see an arrangement of the air thermometer for more exact measurements, etc. The thermometric substance is inclosed in the platinum bulb *A*, which is supported inside of a bath, *B*, which is so arranged that the hot gas or liquid whose temperature is to be measured may completely surround the bulb by flowing in at *E* and out at *F*. *DD* are metal screens. There are a number of mercurial thermometers, *T*, which are at the same temperature as the bulb. The bulb communicates with the barometer at *G* by the tube *C*, the connection being shown enlarged at *V*. The pressure of the mercurial column needed to keep the gas in the bulb at a constant volume is that due to the height of the column from *X* to *Y*, and may amount to several atmospheres, or to a height of many feet. The lower end of the mercurial column, or the tube *H*, *I*, *J*, *K*, is fixed, but the upper tube, *PQ*, can be raised indefinitely. As *Q* rises inside of the large tube, *J*, more mercury may be needed, and this is supplied from the reservoir, *R*, through the flexible tube, *L*. The difference in height between the mercurial surfaces at *X* and *Z* is measured by a reading telescope or cathetometer. *M* is the upright standard carrying the apparatus, *N* a movable cradle for the barometer tube worked by the adjusting screw *O*. *S* is a similar arrangement for the reservoir, *R*, with its adjusting screw, *U*.

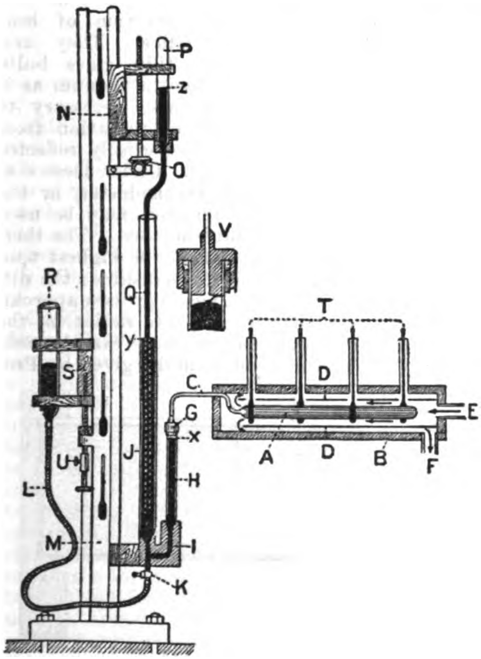


FIG. 2. CHAPPUIS AIR THERMOMETER.

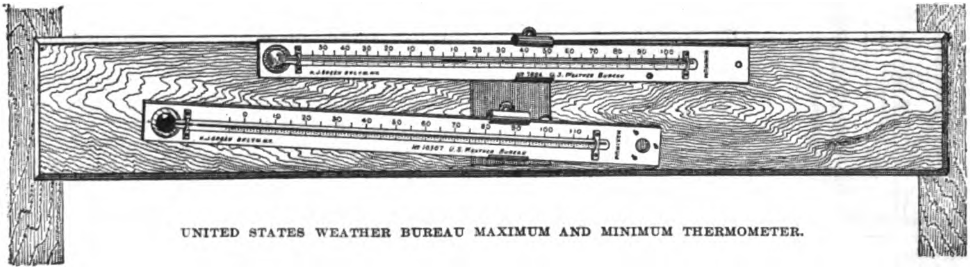
Mercurial Thermometer. This consists of a glass bulb terminating in a long capillary tube. The bulb and lower portion of the tube are filled with clean mercury, while the upper portion is supposed to be quite empty and to be hermetically sealed. When the bulb is warmed the mercury is seen to rise in the tube, because it expands more than the glass of the bulb. This difference of expansion is not regular, nor is it the same for all kinds of glass or for impure mercury. If we wish to construct an independent standard mercurial thermometer, we immerse the bulb in melting ice and make a slight scratch on the glass tube to mark the height of the mercurial column. A similar mark is made at the end of the column when the thermometer is immersed wholly in the steam from boiling water, the exact temperature of the steam depending upon the air pressure at the time. The space between the two lines is divided into 100 more or less equal parts for Centigrade degrees, or 180 equal parts for Fahrenheit degrees, according to the exact temperature found for the boiling water. The space between the freezing point and the boiling point on a thermometer scale is called the fundamental distance. Owing to the irregular expansion of mercury in glass, the so-called standard mercurial thermometer will differ from the standard air thermometer by as much as half a degree about midway between freezing and boiling water. Therefore for accurate work the mercurial should be carefully compared with the air thermometer and the resulting system of corrections throughout the entire length of the scale should be well determined and carefully applied. Owing to the gradual contraction of the glass bulbs, which goes on for several years after they are freshly made, the mercurial thermometer usually has an error that increases with the lapse of time. This error is due to the change in the volume of the bulb, and should be determined after any important work has been done by immediately making a new determination of the freezing point. Instead of this procedure the error can be calculated theoretically, but the actual new determination is far preferable.

A thermometer is not considered first class whose errors of division exceed one or two tenths of a degree Centigrade, or two or three tenths Fahrenheit, especially if these errors change values greatly from point to point along the scale. In determining the temperature of a liquid by the use of the mercurial thermometer one must be very careful to keep the liquid thoroughly stirred, because when permitted to rest the colder portions of the liquid settle. In meteorological work all thermometers are exposed in some sort of protecting cage through which the wind may blow freely, but into which the sun's rays, or any obnoxious radiation, cannot penetrate. It is believed that after making due allowance for the sluggishness of the thermometers and the inefficiency of the screens and the ventilating apparatus, it is still true that the various meteorological services of the world obtain the temperature of the air within a half degree Fahrenheit or two-tenths Centigrade. A general comparison between the Centigrade and Fahrenheit scales is here given.

Cent.	Fahr.	Cent.	Fahr.
+125°	+257°	0°	+ 32°
100	212	−17.8	0
75	167	25	− 13
50	122	40	40
+ 25	+ 77	−273	−491

Dew-Point Thermometer. This is an ordinary thermometer specially arranged for the determination of the temperature at which dew is formed in the atmosphere when the air is cooled. To this end the bulb and larger part of the stem of the thermometer are immersed in a thin glass cup nearly full of sulphuric ether. A current of air is driven through the ether, causing it to evaporate and therefore to cool. The thermometer follows the falling temperature of the ether until the observer perceives the deposition of dew on the outside of the glass cup. The current of air is then cut off. The ether and glass cup begin to warm; the dew evaporates from the surface, and as it disappears the temperature is again read off. The mean of the two readings of the thermometer corresponds closely to the dew point. The results are most exact when the cooling is so carefully conducted that the dew forms and disappears with an inappreciable change in temperature of the thermometer. See HYGROMETER.

Wet-Bulb Thermometer. This is an ordinary thermometer whose bulb is covered very neatly with the thinnest muslin, which is kept wet. The wet-bulb thermometer should either be rapidly whirled in the air or else exposed to a current of air at the rate of five or ten feet a second. The evaporation of the water cools the thermometer to the temperature of evaporation, which is about half way between the temperature of the air and the temperature of the dew point. The combination of a dry-bulb and a wet-bulb thermometer constitutes a psychrometer, and the whirled or ventilated psychrometer is the ordinary apparatus used by meteorologists for determining the humidity of the atmosphere. The formulæ and tables used by the Weather Bureau in this work are those prepared by Prof. C. F. Marvin and published as Weather Bureau No. 235 (Washington, 1900). See HYGROMETER for illustration and further description.

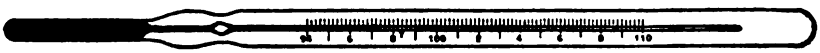


UNITED STATES WEATHER BUREAU MAXIMUM AND MINIMUM THERMOMETER.

Alcohol Thermometer. This differs from the mercurial thermometer only in that the interior liquid is alcohol. But this difference is important from many points of view, since one class of errors disappears and another is introduced. Alcohol, ether, and in recent years toluol, are used in thermometers for the measurement of very low temperatures, since mercury freezes at about −40° Fahrenheit. The principal error in using such liquids for low temperatures arises from the fact that the liquid adheres to the sides of the glass tube and requires a long time to drain down, which indeed it never does perfectly.

Solar-Radiation Thermometer, or Black-Bulb Thermometer. This is essentially an ordinary mercurial thermometer, whose bulb is covered with a thin layer of nonreflecting and almost perfectly absorbing lampblack. Under the assumption that the black-bulb thermometer absorbs and radiates more easily than the plain glass bulb, and especially more so than a polished silver bulb, the difference between the readings of two such thermometers exposed to the sunshine will depend primarily upon the intensity of the radiation received by them. In order to measure the solar radiation, it is necessary, first, to diminish as much as possible the conduction and convection of heat to or from thermometer bulbs. They are, therefore, inclosed in large thin glass bulbs within which there is as perfect a vacuum as it is possible to make. It is also necessary to cut off as much as possible of radiation from the surrounding objects, and especially reflected sunshine, by means of screens. Under these conditions the solar-radiation thermometer, or the so-called Arago-Davy actinometer, may be used in two ways: (1) The static method. The thermometers are allowed to attain the highest temperatures they can in the full sunshine; the difference between their readings expresses approximately the intensity of the solar radiation, the exact value of which may be more exactly computed by the method and formulæ given by Professor William Ferrel in his memoir "Temperature of the Atmosphere and Earth's Surface," pages 34–50, *Professional Papers of the Signal Service, No. 13* (Washington, 1884). (2) The dynamic method. The bright and black-bulb thermometers are successively exposed to the full sunshine and shaded from it a minute at a time, so that one may determine the initial rate of increase of temperature in the sunshine and the rate of cooling in the shade. From these rates the solar radiation is calculated by the formulæ first applied by Pouillet to his actinometer. Much more exact methods of measuring radiation are now employed. See PYRHELIOMETER.

Maximum Thermometer. This is usually a mercurial thermometer having a device by which the top of the column of mercury remains at the highest point that it attains during any given interval of time until the observer has recorded the reading and adjusts the instrument for another observation. In the Rutherford maximum the stem of the thermometer lies nearly horizontal. The rising mercury pushes a little steel index upward within the bore of the tube. When the temperature falls the index is left in place until the observer draws it back to the top of the mercurial column by means of a magnet. In the Phillips or Walferdin thermometer the thermometer stem is horizontal. A small bubble of air makes a permanent break in the upper part of the mercurial column. When the temperature begins to fall the lower column contracts into the bulb, but the upper portion remains and registers the maximum temperature. The Negretti and Zambra maximum thermometer has the bore of the tube constricted below the bottom of the scale so that the mercury that has pushed up past this point cannot easily slide back. After the maximum temperature has been recorded the observer forces the column of mercury back by whirling the thermometer in a circle. The clinical thermometers of physicians are made after this pattern.



CLINICAL THERMOMETER.

Minimum Thermometer. The best form of this is the Rutherford alcohol minimum, in which the stem is kept nearly horizontal, and the contracting column of alcohol draws downward a glass index, which remains in place when the temperature rises. The observer sets the index anew by inverting the instrument, when the index slowly falls to the end of the column of alcohol.

Combined Maximum and Minimum or Six's Thermometer. This consists of a U-shaped tube whose upper ends have respectively a large bulb full of alcohol and a small bulb partly full of alcohol. The lower portion of the legs of the U is filled with mercury and in each leg there floats an index. One of these indices is forced up by the expansion of the alcohol in the bulb and the index is left at the maximum temperature. The other index is raised by the contraction of the alcohol and the consequent rising of the mercury which is pushed up by the expansive force of the air pressure in the small bulb. Modifications of this thermometer are used in Austria, England, and America, but none of its forms is considered to be so reliable as the separate maximum and minimum thermometers previously described.

Upsetting Thermometers. These were invented by Negretti and Zambra and have been modified and improved from time to time. An ordinary thermometer has its tube so bent that when the thermometer is turned upside down the column of mercury above the constriction will run off into a separate portion of the tube, where it remains until the observer can make the necessary reading. The thermometer is especially adapted for recording deep ocean temperatures or temperatures at any hour of the night.

Clinical Thermometers. These are used to determine the body temperature of animals. The figure illustrates one of the more common forms of mercury in glass clinical thermometers used in America for determining the temperature of the human body (mouth or rectum). The bulb is of high-grade thin glass, and the stem is oval in cross section, forming a cylindrical lens which serves to magnify the capillary mercury thread. Temperatures from 94° F. to 110° F., graduated in one-fifth degrees, are engraved on the front of the lens face. The thermometer registers the highest temperature to which it is exposed. The self-registering device is usually obtained by forming a constriction or trap in the capillary tube between the bulb and the lowest temperature graduation on the scale, of exactly the correct size, such that the mercury may expand through the contraction in fine globules, but cannot flow back. From one-half to three minutes are required to obtain the final temperature indication when placed in the mouth, and before the thermometer is used again the mercury column must be shaken down into the bulb. To avoid the possible objection that the temperature graduations, which are in part filled with black coloring matter, may retain disease germs not readily removable by antiseptic liquids, clinical thermometers are sometimes made with the scale inclosed in a smooth glass tube, or a thermometer of the type illustrated is completely covered by a thin glass envelope.

Metallic Thermometers. These depend for their action upon the differential expansion of metals. As made by Breguet, 1817, or Herrman and Pfister, 1865, they consist essentially of two thin spiral bands of different metals soldered together. Differences of temperature cause the spiral to coil or uncoil and the apparatus can easily be adapted for self-registration.

Optical Thermometers. The plane of polarization of a quartz crystal is rotated about the axis of a beam of light by the varying temperature of the quartz, increasing with great regularity with the increase of temperature. This apparatus is recommended by Cornu for the study of high temperatures when the gas thermometer fails because of the softening of the bulbs containing the gas or air.

Thermoelectric Thermometers. Melloni's thermoelectric pile. Pairs of pieces of different metals are soldered together and the extremities communicate by a wire with a needle galvanometer or voltmeter. Any difference of temperature between two consecutive junctions causes the electric current to traverse the wire; its strength is an index of the temperature. The absolute value of the galvanometer scale can be expressed in thermometric degrees by means of careful comparisons. The thermoelectric thermometer can be made to give extremely reliable results.

Resistance Thermometer. Metallic conductors of electricity, such as iron, nickel, platinum, and the like, change their resistance with change of temperature, and this property is utilized in the construction of electrical resistance thermometers which have now become one of the most convenient forms of secondary thermometers available for precise temperature measurements. On account of the permanence of its properties and the wide range of temperatures over which it may be employed, pure platinum in the form of wires or other appropriate shape is generally best suited for exact work, but nickel is also excellent for many purposes, especially for ordinary temperatures. One great superiority of resistance thermometers is their adaptability to almost any requirements and the further fact that the measuring apparatus may be located at some distance from the wire resistance coil, the two being connected by appropriate leads arranged to eliminate the effects of their resistance. A Wheatstone bridge with accessories is employed to measure the resistance of the platinum coil. In some cases a potentiometer is employed for the same purpose. The indications of resistance thermometers must be reduced to the gas state by appropriate corrections found by comparisons.

Thermophone. This is a resistance thermometer, with which a telephone instead of a galvanometer is used to adjust the Wheatstone bridge to a balance. The equality of resistance is indicated by the absence of all sound when one listens at the telephone. This instrument, the invention of G. C. Whipple, is both accurate and portable and very convenient for use in boats on lakes or at sea. Consult "The Thermophone," in *Technology Quarterly*, vol. viii, p. 25 (Boston, 1895).

Langley's Bolometer. This is a differential thermometer in which the difference of temperature of two delicate wires is shown by the deflections of a galvanometric needle. See BOLOMETER.

Deep-Sea Thermometer. This is an ordinary or self-registering mercurial thermometer wholly inclosed within a very strong protecting case of glass. The space between the thermometer and its inclosure is partly filled with water or mercury above which some air remains. When this arrangement is lowered to the bottom of the ocean the great external pressure compresses the inclosure but does not seriously affect the bulb of the thermometer within.

Soil Thermometer. This was formerly made with a large bulb and wide tube many feet in length, so that a bulb buried at a depth of even 20 feet would show the top of the liquid column above the surface of the earth. As these were expensive, sluggish, and liable to accident, the modern practice is to use an ordinary thermometer inclosed in a wooden tube and pushed down to the proper depth in a hole in the ground. Modern electric thermometers, especially the thermophone, are to be recommended.

Nocturnal-Radiation Thermometer. This is supposed to give the approximate temperature of a surface exposed to radiation during the nighttime. The bulb is of glass, sometimes, but not necessarily, blackened; it is fully exposed to the open sky. If all terrestrial heat is cut off by screens the thermometer may be made to give an indication of the clearness of the sky or the temperature of the air that occupies the dome of the sky. If, however, no attempt is made to cut off the radiation and conduction of heat, the thermometers give the temperature of the leaves on the trees. If the thermometer lies upon the upper surface of a metal or wooden or stone object, it gives approximately the temperature of the upper surface layer of that object.

Integrating Thermometer. This is intended to sum up the temperature, or it may be the temperature changes, during any given interval of time. A clock or chronometer whose pendulum or balance wheel is uncompensated or even intentionally overcompensated has a rate that varies with the temperature and becomes an admirable integrator. A metal bar, supported on an inclined surface by means of sharp-pointed feet at either end, creeps upward with alternating rising and falling temperatures. Each step of its progress is proportional to the difference between the successive maxima and minima. Thus, such an arrangement will, in the course of a month, sum up the daily ranges of temperature.

Evaporation Thermometer. In 1888 Dr. Müller-Erzbach brought out a thermometer in which a vessel full of water in the sunshine communicates with an empty vessel in the shade. The water evaporated in the former condenses over into the latter vessel, where it is absorbed by concentrated sulphuric acid. The weight lost in one vessel or gained in the other is an index to the average temperature that has prevailed in the water flask. Comparative observations give the means of converting these weights into temperatures. Experimental tests of this form of integrating thermometer made at the Seewarte in Hamburg show that this apparatus gives excellent results when the daily temperature variations are not too great.

Thermographs. This term may include all forms of apparatus in which continuous registration is introduced. To this end the English Meteorological Office employs photography, maintaining a continuous photographic register of the variations of the top of the mercurial column. The French and the United States Weather Bureaus use the thermographs made by Richard at Paris, in which some form of metallic thermometer is attached to a pen which moves vertically over a sheet of paper that is drawn horizontally by clockwork so that the temperature may be subsequently read off at any given moment.

Owing to the great importance of the thermometer in every branch of science and the arts, the principal governments of the world have established bureaus of standards for the comparison and calibration of this and other forms of measuring apparatus. In all cases private individuals may send their thermometers to these institutions for examination and may receive certificates stating the exact value of the corrections for their errors if any exist. Such institutions are the following: the Kew Observatory at London, now a branch of the Bureau of Standards; the Imperial Physical and Technical Institute at Charlottenburg, near Berlin; the International Bureau of Weights and Measures, Paris; and the Bureau of Standards established by the United States government at Washington, under the Treasury Department in 1900, and later transferred to the Department of Commerce. See THERMOMETRY.

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THERMOMETER, Clinical or Medical. See Thermometer.

THERMOM'ETRY (from Gk. *θέρμη*, *thermē*, heat + *-μετρία*, *-metria*, measurement, from *μέτρον*, *metron*, measure). The science of assigning proper numerical values to the temperature of bodies. As explained in Heat, this involves several steps, the arbitrary selection of (1) some substance as the thermometric body, (2) some property of it which changes with the temperature, (3) two standard thermal states, e.g., melting ice and boiling water at standard pressures, (4) the scale or the number of degrees between these standard temperatures, and (5) two arbitrary numbers to represent these standard temperatures.

By definition the temperature on the standard hydrogen thermometer, Centigrade scale, is as follows:

Hydrogen is the gas used, the initial pressure being 100 cm. of mercury. Change in pressure at constant volume is the effect measured.

The two standard thermal states are (1) melting ice and (2) vapor rising from boiling water at normal atmospheric pressure.

One hundred degrees are chosen between these two temperatures. The temperature of melting ice is called 0°. Then, if p_0 is the pressure of the gas at 0°, p_{100} that at 100°, and p that at the temperature (t) to which a number is to be given,

$$t = 100\frac{p - p_0}{p_{100} - p_0}.$$

Other gases than hydrogen might be used; and the same definition would apply to temperature on the new scale as on the hydrogen scale. Slight differences, however, would always be observed between the numerical values for the same temperatures.

If the change in volume is the heat effect observed as the temperature is changed, the pressure being kept constant, the obvious definition of the numerical value of the temperature is

$$t = 100\frac{v - v_0}{v_{100} - v_0},$$

where v_0, v_{100}, v are the measured values of the volume of the gas or liquid at 0°, 100°, t°.

If the change in the electrical resistance of a given conductor is the heat effect measured as the temperature is changed, the definition of t is

$$t = 100\frac{R - R_0}{R_{100} - R_0},$$

where R_0, R_{100}, R are the electrical resistances at 0°, 100°, t°.

Similarly almost any heat effect of any body may be taken as the one to measure in order to secure a number for temperature; but the numbers so found all differ in general; and if any thermometer other than the hydrogen one is actually used, the observed numbers must all be corrected by a calibration table connecting the scale of the thermometer used with the hydrogen one.

For measuring ordinary laboratory temperatures either mercury-in-glass or air thermometers are used; for measuring extremely low temperatures, e.g., — 200° C., a hydrogen thermometer or a platinum-resistance thermometer is generally used; for high temperatures, e.g., 300° C., a platinum-resistance thermometer or a thermocouple is used. (See Pyrometer; Thermometer; Thermoelectricity.) For a full discussion of these and other methods reference should be made to the *Reports* of the International Congress of Physics, Paris, 1900, vol. i, articles by Chappuis and Barus, and specially to the publications of the National Bureau of Standards, Washington, D. C.

The scale of temperature as defined above is known as the Centigrade or Celsius (q.v.) scale. There are several other scales in use. The Fahrenheit scale has 32° for the melting point of ice and 212° for the boiling point of water; the Réaumur (q.v.) scale has 0° for the former temperature and 80° for the latter.

It is evident that the definition of temperature as given above is equivalent to stating that in the equation connecting change of pressure with change of temperature, viz.,

$$p - p_0 = ap_0t,$$

a is a constant, the same at all temperatures. This quantity is called the coefficient of expansion at constant volume. Its numerical value for hydrogen is closely $\frac{1}{273}$. Writing the last equation

$$p = p_0(1 + at),$$

it is evident that if $t = -273$, $p = 0$. For a value of t less than this, the pressure would be negative, which is meaningless. Therefore $t = -273$ is the lowest number which this instrument can give; and the corresponding temperature is called absolute zero on the gas scale. If 273 is added to the temperature as defined above on the Centigrade scale, i.e., if temperatures are calculated from absolute zero instead of from the temperature of melting ice, the scale is called the absolute gas scale. Or, in the general case, the absolute gas scale adds to the temperature on any scale the reciprocal of the coefficient of cubical expansion of hydrogen as determined on that scale—on the Centigrade scale this reciprocal is 273.04, and so t° C. is (t + 273.04)° absolute. It is shown in thermodynamics (q.v.) that there is a method of defining temperature which is quite independent of the thermometric substance, and in which the only arbitrary things are the choice of a number for the difference between the temperatures of any two thermal states. This scale is called Thomson's absolute scale, because it was proposed by William Thomson (later Lord Kelvin). If it is agreed to have the temperature of freezing and boiling water 100° apart, it is found that the numbers on the Thomson absolute scale agree most remarkably with those given on the absolute gas scale as defined above.

In the practical use of thermometers there are numerous precautions and corrections which are necessary, and for these reference must be made to some laboratory handbook.

The range of applicability of ordinary thermometers is limited in many ways: the liquid may freeze or may evaporate; the material of the bulb may change its volume or it may absorb some of the gas if it is a gas thermometer, etc. Thus a mercury thermometer cannot be used with accuracy above about 450° C.; a hydrogen thermometer cannot be used above 500° C.; nor a nitrogen thermometer above 1550° C.; and at these high temperatures extraordinary precautions are necessary if accuracy is to be secured. Within recent years methods for giving numbers to temperatures much higher even than these referred to have been perfected, based upon laws of radiation (q.v.). It has been shown from theory that there are two laws connecting temperature with the radiation from a black body. These may be stated as follows:

1. The total radiation from 1 sq. con., $E = aT^4$.

2. The radiation associated with waves whose wave lengths lie between λ and $\lambda + d\lambda$, $Jd\lambda = \frac{c}{\lambda^5}e^{-\frac{b}{\lambda T}}d\lambda$, provided the waves are short, i.e., visible. Where T is the absolute temperature on Thomson's scale, λ is the wave length, e is the base of the natural system of logarithms, and a, b, and c are constants. Calling T $273 + t°$ C., it is possible to test the laws by measuring the radiation from black bodies whose temperatures are determined by nitrogen thermometers. In this way the values of the constants a, b, and c may be deduced. Then, in order to determine the temperature of any black body at any temperature, no matter how high, either the total or the partial radiation may be measured; and since the constants are now known, the value of T may be deduced. This scale of temperature is called the radiation scale. It is obvious that the method just indicated can be applied to studying the temperatures of black bodies only. But, if there is any body at a high temperature, it must be possible to have a black body at a somewhat lower temperature whose total radiation is the same as that of the former, in which case, if the total radiation from this is measured and T calculated, it is the temperature not of the body but of the equivalent black body—this T is less than the temperature of the body, and is called its black-body temperature with total radiation. Similarly, if a partial radiation method were used, a value of T would have been found, less than the actual temperature, called the black-body temperature with radiation of a definite wave length. C. E. Mendenhall has devised a method by which for different metals it is possible to find the difference between their true temperature and their black-body temperature; and so, if the latter is observed, the former may be deduced.

Several types of instruments have been constructed for obtaining black-body temperatures; one set making use of the Stefan-Boltzmann law $E = aT^4$; the other, of Wien's law

$$J = \frac{c}{\lambda^5}e^{-\frac{b}{\lambda T}}.$$

One of the best known of the former is the Féry radiation pyrometer, which is essentially an instrument for measuring total radiation. This is allowed to fall upon a blackened disk whose temperature is read by a thermocouple. In practice the instrument is calibrated by measuring the E. M. F. of the thermocouple when the instrument is exposed to radiation from a black body whose temperature can be varied and measured. Then, when the instrument is directed to the body whose temperature is desired, the E. M. F. is measured and the corresponding temperature found from the calibration values.

In the use of Wien's equation $J = \frac{c}{\lambda^5}e^{-\frac{b}{\lambda T}}$, where the partial radiation only is studied, λ is a constant, and the equation can be put in the more convenient form $\log J = A - \frac{B}{T}$, where for a known value of λ, both A and B are known constants. Therefore, to determine T it is necessary to measure J. There are two well-known instruments in ordinary use, the Wanner and the Holborn-Kurlbaum optical pyrometers. In the former instrument the light from the body whose temperature is desired and also that from a standard electric lamp is dispersed by a prism (or passed through a colored screen, e.g., a piece of colored glass), and only light of one color used; and that from the standard lamp is weakened in intensity by known fractions until it equals that from the hot body; then the intensity of the standard lamp is compared with that of the light of the same color from a black body of a known temperature, one being altered by known fractions until they are equal. Thus, by the use of the above formula, the value of T may be deduced. What this procedure really amounts to is this: by the latter observation the intensity of the standard source is measured, since A, B, and T are known; by the first observation the intensity of the light from the body whose temperature is desired is measured in terms of that from the standard source —then, since J, A, and B are known, T may be deduced. In comparing the intensities of the two lights, a polarization photometer is used.

The Holborn-Kurlbaum instrument is essentially a telescope containing in the focus of the eyepiece the filament of an electric lamp, the current through which can be varied. Light of one color is secured for all the observations by the use of absorbing screens. In order to calibrate the instrument, it is pointed so as to receive the radiation from a black body whose temperature can be varied and can be measured; the instrument is focused so as to bring the light from the black body into focus exactly in the plane of the filament of the lamp; the current through this is varied until the filament disappears against the background, showing that the intensities of the two are equal. The temperature of the black body and the current in the lamp are noted; the former is changed and the corresponding current is observed, etc. Then, to determine the black-body temperature of any surface, the instrument is focused upon it and the value of the current in the lamp is observed, which corresponds to the disappearance of the filament; by means of the calibration the temperature may be deduced at once. The instrument may be used in a different manner by applying a revolving sectored disk to lower the intensity of the light.

History. The invention of the thermometer must be attributed to Galileo, who in about the year 1593 made an open-air thermoscope, consisting of a bulb with a long tube attached, which was provided with a scale and dipped below the surface of a liquid—water or wine; some of the air was expelled from the bulb, and so the liquid rose in the tube. This thermometer was used by Galileo for various purposes, such as studying freezing mixtures and recording atmospheric temperatures. It was later used (1611) by Sanctorius in the diagnosis of fevers. The word "thermoscope" was used by Bianconi in 1617 and "thermometer" in 1624 by Leurechon. The first scaled thermometers were those of Ferdinand II, Grand Duke of Tuscany (1641); these contained alcohol. In 1661 Fabri made a scale, using as the fixed temperatures those of snow and of midsummer heat. Robert Hooke in 1664 proposed the freezing point of water as one of the fixed temperatures; and in 1694 Renaldini proposed this as one, and the boiling point of water as the other. In 1709 Fahrenheit introduced his alcohol thermometers, and in 1714 his mercury ones. About 1731 Réaumur devised his scale, which until recently was in extensive use on the continent of Europe. In 1742 Celsius proposed a Centigrade scale, with the temperatures of melting ice 100° and boiling water 0°. Christin, working independently of Celsius, proposed a Centigrade scale in 1743 which is the Celsius scale inverted, and is the one used now. See Radiation; Thermometer. For bibliography, see Thermometer.

THER'MOPHONE. See Thermometer.

THER'MOPILE. See Thermoelectricity.

THERMOP'YLÆ (Lat., from Gk. Θερμοπύλαι, from *θερμός, thermos*, hot + *πύλα, pyla*, gate). A pass famous in ancient Greek history, leading from Thessaly into Locris, named from the presence of several hot springs (Map: Greece, Ancient, C 2). It lies south of the present course of the river Sperchius, between Mount Œta and the Maliac Gulf. In ancient times it was only a narrow track, less than 50 feet wide, but the alluvial deposits have altered the coast line so that there is now a broad swampy plain from a mile and a half to three miles broad. Thermopylæ has won an eternal celebrity as the scene of the heroic death of Leonidas I (q.v.) and his three hundred Spartans in their attempt to stem the tide of Persian invasion (480 B.C.). But he was betrayed by Ephialtes, a Thessalian, into the hands of the Persians, who advanced by a path over the mountains and fell upon his rear. In 279 B.C. a large army of Greeks held Brennus and his Gauls at bay until they also found a path over the mountains. The Greeks, however, escaped on their fleet. Again, in 191 B.C., Antiochus endeavored to check the Romans at this point, but Cato stormed the fortress which commanded the path, and, aided by a frontal attack of the main force, routed the Syrian army. Consult *Herodotus*, vii, 175 ff., with the commentary by Messrs. How and Wells, vol. ii (Oxford, 1912), and that by Macan (London, 1908). Consult G. B. Grundy, *The Great Persian War* (London, 1893); K. Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909).

THERMOS BOTTLE. See Liquefaction of Gases.

THER'MOSCOPE (from Gk. *θέρμη, thermē*, heat + *σκοπεῖν, skopein*, to look). A device to indicate relative temperatures by making use of the property possessed by substances of changing their state or volume under the influence of heat. See Thermometer.

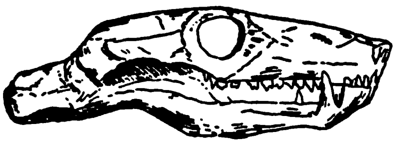
THER'MOTHER'APY. See Hot-Air Treatment; Therapeutics.

THERMOT'ROPISM (from Gk. *θέρμη, thermē*, heat + *τροπή, tropē*, a turning, from *τρέπειν, trepein*, to turn). Primarily, the sensitiveness of plant organs to unequal temperatures on opposite flanks which causes them to bend (positively) towards or (negatively) away from the higher temperature. The same organ may be both positively and negatively thermotropic at different ranges of temperature.

THÉROIGNE DE MÉRICOURT, tā'rwăn'y' de mȧ'rē'kōōr' (1762–97). A prominent figure during the French Revolution. She was born at Marcourt, near Liége. Her true name was Anne Josèphe Terwagne. Knowing all the leaders of the Revolution, she became an enthusiastic Republican and the commander of the mobs of women that played such a conspicuous part in the dramatic days of the Revolution. Armed with sabre and pistol, she led her feminine battalions against the Bastille, July 14, 1789, to Versailles on October 5–6 of the same year, and after her return from an Austrian prison was prominent during the disturbances on June 20 and Aug. 10, 1792. In May, 1793, while defending the Girondist Brissot, her lover, she was seized, stripped, and whipped by a mob of maddened women. She became insane from this treatment, and spent the rest of her life in La Salpêtrière.

THE'ROMOR'PHA (Neo-Lat. nom. pl., from Gk. *θήρ, thēr*, wild beast + *μορφή, morphē*, form). A name applied to several widely dissimilar groups of fossil reptiles which possess certain common characters of skull, vertebræ, limb girdles, and digital formula. Another ordinary name, Anomodontia, is often used synonymously with Theromorpha. The theromorphs, together with the turtles and plesiosaurs, compose the great reptilian division Synapsida (Osborn), characterized by certain mammal-like features of the skull and the mammalian digital formula. All known theromorph remains have been found in the rocks of Permian and Triassic age. They were for the most part animals of rather heavy build, adapted to land life and sluggish habit, though one group appears to have been marine. The following suborders are commonly recognized:

(1) Cotylosauria or Pareiasauria. A group of reptiles having a solid cranial roof with a large pineal foramen, and usually with teeth on the vomer, pterygoid, and palatine bones. It is probable that these forms stand closest to the ancestral Stegocephalia or armored Amphibia. The best-known example is *Pareiasaurus*, from the Karoo beds of South Africa, a heavily built land animal, 8 feet long. (2) Theriodontia. A group which closely resembles mammals in the differentiation of the teeth into incisors, canines, and molars, and in certain features of the skull. Most genera have a distinctly carnivorous dentition, but a few, the Gomphodontia, have crushing molars. Nearly all the known theriodonts are from the South African Trias. *Cynognathus*, in which the skull is remarkably doglike, equaled the black bear in size and general proportions. Many zoölogists believe that mammals have been derived from theriodonts. (3) Dicynodontia. Land reptiles from the Trias of Scotland and South Africa, known chiefly from the skull, which is greatly modified, having the teeth entirely wanting, as in *Udenodon*, or reduced to a single pair of large tusks in the upper jaw, as in *Dicynodon* and *Gordonia*.



SKULL OF A THERIODONT (*Galesaurus*).

More recent research seems to show that it is advisable to separate the Cotylosauria from the mammal-like reptiles proper, and to place these latter in an order, Therapsida. This order may be subdivided into five groups or suborders. (1) Dinocephalians. These form a well-marked group of large, heavily built, herbivorous reptiles, which occur in South Africa and Russia, and are especially interesting from their forming a connecting link in essential structure between the pelecosaurs of America and the more mammal-like reptiles of South Africa. (2) Dromasaurians. A group of small, ratlike running reptiles, which form the earliest-known direct ancestors of the mammals. (3) ANOMODONTIA. Synonymous with the Dicynodontia above mentioned. (4) THEROCEPHALIANS. A group of carnivorous reptiles living in Middle and Upper Permian times in South Africa and Russia. Though in many points of structure they closely agree with the anomodonts, they have a series of pointed incisors, one or two large canines, and a number of small, pointed molar teeth. (5) CYNODONTIA. These are the extremely mammal-like carnivorous reptiles which flourished in Middle and Upper Triassic times in South Africa. They resemble the mammals in the complicated structure of the molar teeth, in the structure of the skull, and in the joints of the toes, and there is little doubt that the later mammals are descended from a member of this order.

THERON (Lat., from Gk. Θήρων) (?–472 B.C.). A tyrant of Agrigentum (q.v.), c.488–472 B.C. He aided Gelon (q.v.) to win the great victory over the Carthaginians at Himera, in 480 B.C. (See SICILY, *History*.) Consult G. Grote, *Greece*, chap. xliii, and E. A. Freeman, *History of Sicily*, 4 vols. (Oxford, 1891–94).

THEROP′ODA. See DINOSAURIA.

THERSITES, thẽr-sī′tēz (Lat., from Gk. Θερσίτης). In the *Iliad*, ii, the ugliest and most impudent talker among the Greeks assembled before Troy. He is represented as reviling Agamemnon and Achilles, and is beaten by Odysseus for his insolence. Later writers said he was a son of Agrios, brother of Œneus, and was slain by Achilles, whom he had mocked after the death of Penthesilea.

THÉRY, EDMOND (1854–). A French economist, born at Rognac. He was sent by his government to various countries on economic missions, was president of several societies, and was made Commander of the Legion of Honor. He wrote: *Sous l'uniforme* (1879); *Les réformes économiques nécessaires* (1885); *La crise des changes* (1894); *Les valeurs mobilières en France* (1897); *Europe et Etats-Unis d'Amérique* (1899); *Le péril jaune* (1901); *La France économique et financière pendant le dernier quart de siècle* (1900); *La paix armée* (1903); *Etudes économiques et financières, 1890–1903* (1904); *La banque de France de 1897 à 1909* (1910); *L'Europe économique* (1911); *La fortune publique de France* (1912); *Le régime actuel des chemins de fer en Russie* (1913).

THESAU′RUS. See DICTIONARY.

THESE′UM. See ATHENS.

THESEUS, thē′sūs *or* thē′sê-ŭs (Lat., from Gk. Θησεύς). The national hero of the Athenians, and, next to Hercules, the most famous character of Greek legend. His story owes its prominence largely to the influence of Athens in Greek art and literature, for in the epic Theseus has but small place. A doubtful verse in the *Iliad* associates him, not with Athens, but with the Thessalian Lapithæ and their conflict with the Centaurs, and he appears in the late passage of the *Odyssey* (book xi), which describes the visit of Odysseus to the lower world. The early art knows only the slaying of the Minotaur (q.v.), and seems to have borrowed the type from Mycenæan tradition. Though a thoroughly satisfactory analysis of the Theseus legend is still lacking, it seems probable that it was closely connected with the Marathonian tetrapolis, then crossed to Trœzen, whence it returned to Athens. Its first great development occurred under the Pisistratidæ, when Theseus was recognized as the uniter of Attica, and the type of the gentle and just ruler, beloved of his people, a sort of mythical predecessor of Pisistratus. (See ATHENS, *History*, first paragraph.) Soon after the Persian wars the democracy transformed him into its real founder who protected the injured from other states and forced Creon and Eurystheus to observe justice and humanity. At this time (473 B.C.) his reputed bones were brought from Scyros to Athens with great pomp by Cimon, and an heroön, the Theseum (q.v.), was erected. In origin, Theseus is probably best considered as a beneficent deity, a local parallel to Hercules, who slays monsters and gives peace and security to his worshipers, but, like other nature divinities, descends into the lower world and is subject to the powers of death. Legend made Theseus the son of Æthra, daughter of Pittheus, King of Trœzen. His father was commonly said to be Ægeus, King of Athens, though early legend recognized the paternity of Poseidon. (The two versions are really the same, Ægeus being originally a name of the sea god.) He was brought up at Trœzen, and on reaching manhood proceeded to his father's residence at Athens. On his way thither across the isthmus he destroyed robbers and monsters who rendered the route unsafe for travelers, such as Periphetes, Sinis, the Crommyonian sow, Sciron, Cercyon, and Procrustes. (See PROCRUSTES.) On his arrival in Athens he found the sorceress Medea (q.v.) living as his father's wife, and escaped her attempt to poison him only through Ægeus' timely recognition of his own sword and sandals, which he had left in Trœzen for his son. Medea fled and Theseus overcame Pallas and his sons, who attempted to secure the royal power. He also bound the Marathonian bull, which was ravaging the tetrapolis. Then came the expedition to Crete to deliver Athens from its tribute to the Minotaur (q.v.). On this voyage he proved his descent from Poseidon by bringing back the ring of Minos from the depths of the sea, and by the help of Ariadne (q.v.) killed the Minotaur. On his way back he founded a festival of Apollo at Delos, to which the Athenians ever after sent an annual embassy.

As his father, Ægeus, had destroyed himself in the belief that his son had perished in Crete, Theseus now became King of Athens and consolidated into one state the twelve independent communities of Attica, in celebration of which event was instituted the festival of the Panathenæa (q.v.). That the festival commemorated such an event is probable, but this does not prove the historical personality of Theseus. Legend also told of his friendship for the Lapith King Pirithoüs, at whose wedding he fought the Centaurs (see LAPITHÆ), with whose aid he carried off Helen to Aphidna, and with whom he finally descended to the lower world that his friend might carry off Persephone as his bride. Pirithoüs never returned, and Theseus remained in captivity till Hercules, on his quest for Cerberus, prevailed on Hades to release him. Athenian legend also told of the great invasion of the Amazons (q.v.) in his reign, of the straits to which they reduced the Athenians, and of their final rout by the hero, who secured as wife their queen, Antiope or Hippolyta (q.v.), by whom he had a son, Hippolytus. Later he married Phædra (q.v.), daughter of Minos and sister of Ariadne. It was said that during his absence in the lower world Menestheus, with the help of Castor and Pollux, who had come to rescue Helen, made himself King, and that Theseus, unable to reëstablish his authority, went to Scyros, where he was murdered by Lycomedes (q.v.). Much in the character of Theseus as it appears in legend seems due to Athenian desire to represent their national hero as the embodiment in heroic times of the virtues on which they prided themselves in historic times, and which the great heroes of the national epic often conspicuously lacked. Consult: J. E. Harrison, *Mythology and Monuments of Ancient Athens* (London, 1890); Otto Gruppe, *Griechische Mythologie und Religionsgeschichte* (2 vols., Munich, 1896); and the article "Theseus" in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

THES'MOPHO'RIA. See Greek Festivals.

THES'MOPHOR'IAZU'SÆ (Lat., from Gk. Θεσμοφοριάζουσαι, *Thesmophoriazousai*, women celebrating the Thesmophoria). A comedy by Aristophanes (about 410 B.C.). It is aimed against Euripides for his innovations and his dislike for women, on account of which he is dragged to justice by women taking part in the Thesmophoria.

THESPE'SIUS (Neo-Lat., from Gk. *θεσπέσιος*, divinely sounding, divine). An herbivorous ornithopod dinosaur, allied to Hadrosaurus and Iguanodon, which it closely resembles, found fossil in the Upper Cretaceous beds of Colorado, Wyoming, and Montana. It is a large animal, 25 to 30 feet long and 10 to 15 feet high, with medium-sized head, small, almost useless fore limbs, and well-developed three-toed hind limbs upon which it ran in bipedal motion, using its heavy tail to balance the forward portion of the body. Another name for this creature is Claosaurus. A complete skeleton of this animal, mounted as if in the act of running, is in the museum of Yale University. Consult: O. C. Marsh, "The Dinosaurs of North America," in *Annual Report of the United States Geological Survey*, vol. xvi, part i (Washington, 1896); Beecher, "The Reconstruction of a Cretaceous Dinosaur, Claosaurus annectans Marsh," in *Transactions of the Connecticut Academy of Sciences*, vol. xi (New Haven, 1902). See Dinosauria.

THES'PIÆ (Lat., from Gk. Θεσπειαί, *Thespeiai*, Θεσπιαί, *Thespiai*), or Thespia. An ancient town in Bœotia, near the foot of Mount Helicon. Like Platæa (q.v.), it was hostile to the Theban pretension to supremacy in Bœotia (see Thebes), and these two were the only Bœotian cities which refused to give earth and water to the heralds of Xerxes and did not side with the Persians at the battle of Salamis. Seven hundred Thespians joined Leonidas at Thermopylæ (q.v.), and were slain in defending the pass. Thespiæ was burned by Xerxes, but was subsequently rebuilt. Shortly after the battle of Leuctra (371 B.C.) it was again destroyed, and was afterward a second time restored. Here was preserved a marble statue of Eros by Praxiteles (q.v.). On account of the vicinity of Mount Helicon to the town the Muses were called *Thespiades*. The site of the ancient town was near the modern village of Eremokastro.

THES'PIS (Lat., from Gk. Θέσπις). A native of the Attic deme of Icarus in the sixth century B.C., called the father of Greek tragedy. He introduced an actor to reply to the leader of the chorus, who before had recited the adventures of Dionysus and had been answered by the chorus, and thus made an important step towards the drama.

THES'SALO'NIANS, Epistles to the. Two of the Pauline group of New Testament epistles. At Thessalonica, the modern Salonika, then the capital of the Roman Province of Macedonia, a Christian church was founded by Paul, assisted by Silas (Silvanus), about 50 A.D., on the Apostle's second missionary journey (cf. Acts xvii. 1–9). This church was composed, like most of Paul's churches, of a small number of converts from the local Jewish synagogue, together with a much larger number of Gentile Christians. The Jews of the city, however, became so violently hostile that the missionaries, after a stay of not more than a few months, felt that it was best to leave, although the church was still very immature. From Berœa, the next stopping place of the missionaries, Paul was driven by persecution started by Jews from Thessalonica. He went on to Athens and eventually to Corinth, where he remained a year and a half (until the fall of 51 A.D.). Anxious and uncertain over the condition of things at Thessalonica, from Athens Paul sent Timothy thither to strengthen and comfort the infant church (1 Thess. iii. 1–2). Timothy rejoined Paul at Corinth with a report that rejoiced the Apostle's heart. The young church was indeed tried and persecuted, but thoroughly loyal to the faith and full of love for the missionaries. At the same time Paul perceived that on certain matters the church was in sore need of sound advice. Unable to go to it in person, he sent a letter, now known as 1 Thessalonians, probably the earliest of Paul's letters still extant. Though written in the name of the three missionaries (i. 1), the letter was essentially Paul's own. After the usual epistolary greeting (i. 1) the writers fervently thank God as they recall how heartily the Thessalonians had received the gospel message, and for their exemplary devotion to the gospel ever since (i. 2–10). Fearing lest their sudden departure from Thessalonica might have given rise to suspicions or even charges that they were impostors, the missionaries protest their sincerity and unselfish love, which must have been evident to all the brethren (ii. 1–12), and are thankful that their message had been received as the word of God, although persecution was the result (ii. 13–16). They are reminded how Paul had earnestly desired to revisit them but was prevented (ii. 17–20). He had therefore sent Timothy (iii. 1–5), who had just returned with a most comforting report (iii. 6–10). He prays that he may be guided to see them again and that they may be preserved perfect unto the end (iii. 11–13). The letter now becomes less personal and more didactic. The readers are reminded that they must live pure and holy lives (iv. 1–8) and abound in brotherly love (iv. 9–12). Those who had recently been bereaved and were in fear that believers who died before the Parousia would not share in its glory and blessing are comforted by the assurance that such will not be the case (iv. 13–18). The teaching is added that the Parousia, though it will come suddenly, will bring no disaster to those who are watchful and faithful (v. 1–11). After a number of brief practical exhortations the letter closes with a prayer, injunction as to its being read to all, and a benediction (v. 12–28). The whole letter doubtless reflects the general character of Timothy's report of conditions at Thessalonica. But it is more than a message based on that report. It also reflects and unveils the Apostle's own state of mind as he thought of himself and his message in connection with that little company of believers, bereft of his counsel and subject to trial and persecution. The epistle is a most valuable witness to Paul's love for and devotion to his converts. The absence of doctrinal discussion incidentally reveals how comparatively simple Paul's missionary preaching was. This infant church, but a few months old, was not prepared for such deep discussions as are contained in Romans. 1 Thessalonians bears on its face so unmistakably the stamp of genuineness that it is accepted as Paul's by practically all modern scholars.

This letter, no doubt, was eagerly read by the believers at Thessalonica and its admonitions heeded. In the meantime Paul was busy with his missionary work in Corinth. During this period Paul learned, presumably through messengers from Thessalonica, that while the general condition of the church there was satisfactory, yet on some points it was in need of further instruction or admonition. In particular the expectation of the speedy second coming of Christ was causing some a great deal of anxiety, and in other cases leading to the expression of startling views. Paul's teaching on this subject was as yet only imperfectly understood. What he had said on this matter in his first letter had produced on some an effect other than that intended by the Apostle. Certain ones, perhaps those of a more excitable temperament, were asserting that the Parousia was immediately impending (cf. 2 Thess. ii. 2), even claiming (so it was told Paul) that letters from Paul contained such teaching. Such agitation led some to neglect their everyday duty (cf. 2 Thess. iii. 10) or to be less careful to maintain that high moral standard of conduct that Paul always made absolutely essential (cf. 2 Thess. iii. 6–15). On the other hand, the way Paul had emphasized (in 1 Thess. v. 1–11) the idea that the day of the Lord would take swift vengeance on all the wicked had apparently led some oversensitive souls to be discouraged and feel that they were unworthy of being included among the blessed ones destined to be "ever with the Lord" after his Parousia. Mainly, then, to reassure the timid and disheartened, to discourage unwarranted expectation as to the immediateness of the second advent, and to give helpful, practical advice, such was the purpose of Paul in writing 2 Thessalonians. The encouraging character of the extended thanksgiving section (i. 3–12), the special discussion of the Parousia (ii. 1–12), in which it is explained that first there must be a great manifestation of wickedness which is now held in restraint (by the Roman government with its insistence on law and order?), the words of encouragement in ii. 13–16, and the practical advice in iii.—all these appear perfectly natural and in order in the light of such a purpose.

The Pauline authorship of 2 Thessalonians has been seriously questioned. At present, however, the acceptance of it as Paul's has become more general. The grounds for assigning it to some post-Pauline writer which are entitled to serious consideration are in the main two: (*a*) the many close resemblances to 1 Thessalonians in vocabulary and style, and (*b*) the difference between the two letters in the treatment of the subject of the Parousia (1 Thess. iv. 13–v. 11, compared with 2 Thess. ii. 1–12). The significance of (*a*) is thought to be that it indicates the work of a forger, using 1 Thessalonians as his model, while (*b*) is said to prove diversity of authorship. For a full discussion of these points the reader is referred to the commentaries noted below. The explanation given above of the purpose of 2 Thessalonians fully meets, it is believed, these objections.

In both letters Paul the missionary is revealed as in no other of his extant letters. The general character of his missionary preaching, his large sympathy and his patience with the faults and limitations of his converts, his high hopes for and ideal confidence in them, his anxious care for their moral and spiritual welfare, his firm insistence on morality (purity, temperance, industry, honesty, etc.), and, behind all, the Apostle's own personal consecration and faith—for all this the Epistles to the Thessalonians will ever remain among the most precious memorials of the apostolic age.

Bibliography. The earlier literature on these Epistles is amply reviewed in the larger modern commentaries and need not be cited here. Consult: the *Introductions* of Theodor Zahn (Edinburgh, 1909) and of James Moffatt (New York, 1911), and for commentaries: W. Bornemann in the *Meyer* series (6th ed., Göttingen, 1894); George Milligan (London, 1908); E. von Dobschütz in the *Meyer* series (7th ed., Göttingen, 1909), in many respects the best modern commentary on these Epistles; James Moffatt, in *Expositor's Greek Testament* (New York, 1910); J. E. Frame, in *International Critical Commentary* (ib., 1912).

THES′SALONI′CA (Gk. *Θεσσαλονίκη*). An ancient Greek city, on the northeastern shore of the Thermaic Gulf in Mygdonia. Tradition told of an early city, Eumathia or Halia, on this site, but the historical Greek city appears in Herodotus and Thucydides as Thermæ, a name due to the presence of hot springs in the neighborhood. The exact origin of the later name, which appears in Polybius, is uncertain. Most probable is the story of Strabo, that the town was enlarged and in part rebuilt in 315 B.C. by Cassander, who gave it the name of his wife, Thessalonica, the daughter of Philip of Macedon. Its strong fortifications enabled it to repel a Roman attack, and after the Roman conquest of Macedonia (146 B.C.) it became one of the chief cities of the province. Situated on the great Via Egnatia, it attracted a large trade by land and sea, while the support given to Mark Antony and Octavian seems to have made it a free city. It contained a considerable Jewish colony, and was the seat of a Christian church, founded by the Apostle Paul. It was severely punished by the Emperor Theodosius I, when 7000 citizens are said to have perished because of an uprising, but appears in the later history of the Empire as a strong defense against the Goths and Slavs. It was, however, captured by the Saracens in 904 A.D., by the Normans in 1185, and finally by the Turks in 1430. For the modern city, see SALONIKI.

THES′SALY (Lat. *Thessalia*, from Gk. *Θεσσαλία*, Attic *Θετταλία*, *Thettalia*, Thessaly, from *Θεσσαλός*, *Thessalos*, Attic *Θετταλός*, *Thettalos*, Thessalian). The largest division of ancient Greece, separated on the north from Macedonia by the Cambunian Mountains, and on the west from Epirus by the Pindus range. The Ægean

Sea is on the east. (Map: Greece, Ancient, C 2.) Though Achæa, Ænis, and Malis can properly be included in the general term, Thessaly proper reaches only to the range which extends from Pindus to the head of the Pagasæan Gulf. Others, who include Achæa (Phthiotis), call Mount Othrys the southern boundary. Thessaly proper is a vast plain shut in on every side by mountains; on the north and the west by those already named, and on the east by mounts Pelion and Ossa, the only opening being the Vale of Tempe (q.v.) in the northeast between Ossa and Olympus. The plain of Thessaly is said at one time to have been a vast lake, the waters of which found an outlet by the Vale of Tempe. This plain is drained chiefly by the river Peneus (now Salambria) and its tributaries, and is the most fertile in all Greece; it produced in ancient times abundance of grain and cattle, and a breed of horses considered the finest in Greece, and it still yields large crops.

History. In the epic, Thessaly seems inhabited by a number of tribes, among whom are the Pelasgians of the Peneus valley, and the Achæans and Hellenes in the south. During the migrations that marked the period between the heroic age and that of historical Greece, tribes from the mountains of Epirus and the north pushed into this region, driving out or subjugating the inhabitants. Part of these latter migrated to Asia Minor, where they colonized Æolis. The Bœotians, too, were said to have been crowded out by the newcomers, but it is probable that Bœotians and Phocians were really the vanguard of the invaders. The conquerors settled in the Peneus valley, reducing the original owners to serfs of the soil, who cultivated the land on their own account, paying a fixed proportion to the owners. These Penestæ, as they were called, could not be sold out of the country nor put to death without a trial. The Thessalians themselves constituted a landed nobility gathered about the cities. In these cities a few great families exercised almost unlimited power. Of these, in the sixth and fifth centuries B.C., the most famous were the Aleuadæ of Larissa and the Scopadæ of Crannon and Pharsalus. The league between the cities was a loose one, and there was no supreme authority, except as some family obtained a leading position. Four districts were recognized from early times, Hestiæotis at the north, Thessaliotis and Pelasgiotis in the centre, and Phthiotis in the south, each of which in the fourth century was led by a polemarch. A general council seems to have met when any occasion calling for united action arose, and in war a general called the tagus (Ταγός) was chosen as commander in chief. The league was thus essentially military, but there must have been a well-established system, for in the sixth century B.C. the Thessalians were threatening to extend their power over southern Greece, and seem at one time to have occupied Phocis. Their strength was in their cavalry, composed of the nobles, to which were added peltasts or light infantry, composed probably of Penestæ.

The Thessalians soon brought under their rule the mountainous districts surrounding the Peneus valley, occupied by the Perrhæbians, Magnetes, and Achæans of Phthiotis, who as independent tribes had places in the Amphictyonic Council (q.v.), but later paid tribute and military service to the Thessalians. The other border tribes (Dolopians, Ænianians, and Malians) were also in actual, if not nominal, dependence. The power of Thessaly received a check at the hands of the Phocians, and after the Persian wars it played but a small part in Greek history, until, in the fourth century B.C. for a brief period it was united under the rule of the able tyrant of Pheræ, Jason, who secured his election as tagus, collected a strong force of cavalry and mercenary infantry, organized a fleet, and at the time of his assassination (370 B.C.) seemed likely to anticipate the career of Philip of Macedon. His successors were blood-thirsty tyrants and the united Thessaly was quickly dissolved, though the old district organization was revived under the influence of Pelopidas (q.v.) and the Thebans. During the Sacred wars (q.v.) the country was at one time occupied by the Phocians, but in 352 B.C. passed under Macedonian control, and in 344 B.C. Philip was elected archon (the new name of the tagus) of Thessaly and the country was virtually united to Macedon. Thessaly remained subject to the Macedonian kings till the victory of Flamininus, at Cynoscephalæ, in 197 B.C., placed it under the protection of Rome. Under the Roman emperors Thessaly was united with Macedonia, but after Constantine it was a separate province. In 1204, with other portions of the Eastern Empire, it came under the dominion of the Venetians, and in the fourteenth century it was conquered by the Turks. The southern part of Thessaly was freed from Turkish rule at the time of the Greek Revolution. The bulk of the region was ceded to Greece in 1881 as a result of the demand of the Great Powers made on the conclusion of the Russo-Turkish War. A small mountainous district in the north still belongs to Turkey. In 1897 Thessaly was the principal seat of the Greco-Turkish War, the Turks forcing the Milouna and Raveni passes, in the Olympian range, on the frontier, and finally occupying Larissa. Thessaly comprises the nomes of Phthiotis, Larissa, Karditsa, Trikkala, and Magnesia. Consult: W. M. Leake, *Travels in Northern Greece* (4 vols., London, 1835); A. Philippson, *Thessalien und Epirus* (Berlin, 1897); R. G. Kent, *A History of Thessaly from the Earliest Historical Times to the Accession of Philip V of Macedon* (Lancaster, Pa., 1904); K. Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909); Wace and Thompson, *Prehistoric Thessaly* (Cambridge, 1912).

THET'FORD. A municipal and Parliamentary borough and market town in Norfolk, England, on the Little Ouse, 79 miles northeast of London (Map: England, G 4). It has an eventful history and in the reign of Edward III contained eight monasteries and twenty churches. Its most important relic of antiquity is the castle hill, a mound 1000 feet in circumference and 100 feet high, probably the largest Celtic earthwork in England. Pop., 1901, 4600; 1911, 4778.

THETFORD MINES. A town in Megantic County, Quebec, Canada, on the Quebec Central Railway, 76 miles by rail south of the city of Quebec. There are asbestos mines in the vicinity, and the town has various manufactures. Pop., 1901, 3256; 1911, 7261.

THE'TIS (Lat., from Gk. Θέτις). The most famous of the Nereids (q.v.), daughter of Nereus and the Oceanid Doris. She was loved by both Zeus and Poseidon. When Themis prophesied that her son would be mightier than his father the gods desisted from their suit and compelled her to wed Peleus (q.v.). By Peleus she became the mother of Achilles (q.v.). In Homer she is represented as living with her father in the depths of the sea. She was said to have protected Dionysus when he fled from Lycurgus, and to have tended Hephæstus when he was hurled from heaven by Hera.

THETIS'S HAIR STONE. See Rock Crystal.

THEURIET, tē'rē'ȧ', André (1833–1907). A French poet and novelist, born in Marly-le-Roi (Seine-et-Oise). He studied law in Paris, began practice in 1857, and soon afterward accepted a position in a department of the Ministry of Finance. His interests soon had turned to literature. His favorite field is the provincial idyl of humble life. His first poems were entitled *Le chemin des bois* (1867). The human figures are hewers of wood whose struggles the poet describes truthfully and with feeling. *Le bleu et le noir, poèmes de la vie réelle* (1876) is among his best volumes of verse. Theuriet describes Breton landscapes with charming touches. Of about sixty volumes of fiction the best are *Le mariage de Gérard* (1875; Eng. trans., 1906) and *Amour d'automne* (1888). He also wrote: *Reine des bois* (1890); *La Chanoinesse* (1893); *La sœur de lait* (1902); *Godson of a Marquis* (1906). The nearest analogue to his best fiction is the pastoral work of George Sand, but his style, marked by occasional archaisms, more nearly resembles that of Bernardin or of Rousseau. In the drama, Theuriet wrote *Jean-Marie* (1871); *La maison des deux Barbeaux* (1885); and *Jours d'été* (1901). In 1896 he was elected to the Academy.

THÉVENET, tȧv'nȧ', Marius (1845–1910). A French politician, born in Lyons. He studied law and gained great distinction at the bar of his native city, and was elected a deputy from the Department of the Rhône in 1885. He was appointed Minister of Justice and Public Worship Feb. 22, 1889, in the second cabinet of Tirard. He displayed great activity in this position in the suppression of Boulangism, and vigorously prosecuted Paul Déroulède as chief of the League of Patriots. He was reëlected deputy in 1889, lost his portfolio at the fall of the ministry, March 17, 1890, and in 1892 was elected Senator from the Department of the Rhône. He was implicated in the Panama scandal, but escaped prosecution. His militant attitude in the Dreyfus affair caused him to fail of reëlection to the Senate in 1900.

THIBAUDEAU, tē'bō'dō', Antoine Claire, Count (1765–1854). A French statesman and historian, born at Poitiers. At the outbreak of the French Revolution he was a lawyer in his native city. He was elected to the Convention in 1792, joined the party of the Mountain, and voted for the death of the King. In 1796 he was chosen President of the Council of Five Hundred. He abandoned his extreme views, opposed the *coup* of the 18th Fructidor (Sept. 4, 1797), and was saved from deportation by the intervention of friends. After the *coup* of the 18th Brumaire (Nov. 9, 1799) he was made Prefect of Bordeaux, and held the position of Councilor of State till 1808. In that year he became Prefect of the Department of Bouches-du-Rhône. He helped in the collaboration of the Code and was made Count of the Empire in 1809. On the second return of the Bourbons he was proscribed as a regicide and lived abroad till the revolution of 1830. He was made a Senator by Napoleon III, and died in Paris, March 8, 1854. He wrote: *Mémoires sur la Convention et le Directoire* (1824); *Mémoires sur le Consulat* (1827); *Histoire générale de Napoléon Bonaparte* (1828); *Le Consulat et l'Empire* (1835); *Histoire des Etats Généraux et des institutions représentatives en France* (1843). His autobiography appeared in 1875.

THIBAULT, tē'bō', Jacques Anatole. See France, Anatole.

THIBAUT, tē'bō', or **THEOBALD, I** (1201–53), King of Navarre from 1234 to 1253, originally Count of Champagne and Brie. He was born in France and educated at the court of Philip Augustus. He is said to have been in love with Blanche of Castile, Queen of Louis VIII, and when Louis died, in 1226, some suspected that he had been poisoned by Thibaut. The latter at first allied himself with the league of nobles against Blanche, Regent during the minority of her son, but was soon won over by her. On the death of his uncle, Sancho the Strong of Navarre, in 1234, he succeeded to that Kingdom. He went to Palestine in 1239, but was badly defeated at Gaza. He was a friend of literature and a *trouvère* of no mean order, Dante and Petrarch being among his admirers. His poems were first published by Lévesque de la Ravallière (2 vols., Paris, 1742), and have been republished several times since. Consult Ernest Lavisse, *Histoire de France*, vol. iii, part vi (Paris, 1901).

THIBAUT, Anton Friedrich Justus (1772–1840). A German jurist. He was born at Hameln, and studied at Göttingen, Königsberg, and Kiel, at which latter university he was appointed professor of civil law in 1798. In 1802–06 he was professor at Jena, where he became a friend of Goethe and Schiller. In the latter year he went as professor of civil law to Heidelberg, where he remained until his death. He published: *Theorie der logischen Auslegung des römischen Rechts* (1799; 2d ed., 1806); *Ueber Besitz und Verjährung* (1802); *System des Pandektenrechts* (2 vols., 1803; 9th ed., 1846); *Zivilistische Abhandlungen* (1814).

THIBET, tĭb'ĕt *or* tĭ-bĕt'. A dependency of China. See Tibet.

THIBODAUX, tē'bō-dō'. A town and the parish seat of Lafourche Parish, La., 47 miles west by south of New Orleans, on Bayou Lafourche, and on the Texas and Pacific and Morgan's Louisiana and Texas railroads (Map: Louisiana, H 7). It derives considerable commercial importance from its situation in a fertile rice, corn, trucking, and sugar-cane region. Foundry products, ice, and canned goods are manufactured. Thibodaux College, Mount Carmel Academy, and the Guion Academy are here. Pop., 1900, 3253; 1910, 3824.

THICKET (AS. *þiccet*, from *þicce*, thick; connected with Ger. *dick*, Welsh, Corn. *tew*, thick, and Ger. *dicht*, Dan. *tæt*, Eng. *tight*). A plant society dominated by shrubs. In regions of great rainfall thickets may be regarded as forerunners of forests, but in many arid regions while present conditions remain they are usually the ultimate type of vegetation. Various names have been given to the xerophytic thicket areas. In the southwestern United States they are called chaparral; in the Mediterranean region, maqui; in southern South America, espinal; in Australia, scrub.

THICKHEAD FLY. Any one of the flies of the family Conopidæ, a group comprising species with large and conspicuous heads. They are rather large insects, but are generally slender and with a stalked abdomen. They frequent flowers and their larvæ are parasitic, chiefly upon bumblebees and wasps, and also more rarely upon grasshoppers. About 30 species occur in the United States.

THICK-KNEE. A large, plover-like shore bird of the Old World, representing the family Œdicnemidæ, of which several species are known, all characterized by the enlargement of the tibiotarsal joint. The familiar one of western Europe (*Œdicnemus œdicnemus*) is known in Great Britain as the great or stone or Norfolk plover, or stone curlew, and is a favorite among gunners. See Plate of Bustards.

THICKLEY, East. See Shildon and East Thickley.

THIÉBAUD, tyȧ'bō', Georges (1850–1915). A French publicist, born at Toulouse. He was editor of the *Courrier des Ardennes*, went to Paris in 1885, and in 1887 initiated and managed the unsuccessful campaign of General Boulanger (q.v.) for the presidency. He traveled through France to popularize the idea of digging the Panama Canal and with Barrès (q.v.) preached nationalistic ideals. He was a concise and brilliant writer as well as a gifted orator. He wrote: *Déposition devant la haute cour le seize décembre* (1889); *Le devoir national à l'Hôtel de Ville* and *Parlementaire et plébisoitaire* (both 1900); *Le parti protestant et le progrès protestantisme en France depuis 25 ans* (1905); *Souvenirs d'un publiciste* (1908); *Le secret du règne* (1909).

THIEF RIVER FALLS. A city and the county seat of Pennington Co., Minn., 50 miles by rail northeast of Crookston, on Red Lake and Thief rivers and on the Great Northern and the Minneapolis, St. Paul, and Sault Ste. Marie railroads (Map: Minnesota, A 2). It has a Carnegie library and a large municipal auditorium. The city is situated in a productive farming region, adapted particularly to the growing of wheat, and has large ironworks and a foundry, a flour mill, and a sash and door factory. Pop., 1900, 1819; 1910, 3714.

THIELE, tē'le, Johannes (1865–). A German chemist. He was born in Ratibor and was educated at Breslau and Halle (Ph.D., 1890). In 1893 he was called to Munich and in 1902 to Strassburg, where he served as rector of the university during 1910–11. The results of his many investigations were communicated to the *Berichte der Deutschen Chemischen Gesellschaft* and other chemical journals.

THIELMANN, tēl'män, Johann Adolf, Baron (1765–1824). A Prussian general, born at Dresden. He entered a Saxon regiment in 1782, served through the Rhine campaigns, and fought for Prussia in the battle of Jena in 1806. He was next sent by Saxony as ambassador to Napoleon I, became his ardent admirer, and did much to bring about the Franco-Saxon Alliance. He served with the French as major in the campaign of 1807; fought at Friedland in that year, was made major general, and operated against the Austrians in Saxony. In the Russian campaign of 1812 he commanded a brigade of cavalry and for exceptional bravery in the battle of Borodino was made Baron. As commander of Torgau in the early part of 1813 he entered into communications with the allies, and on being ordered by the Saxon King to deliver the town to the French, resigned his post and went over to the enemy. He was given command of a Saxon corps which participated in the invasion of France in 1814. He next joined the Prussian army (1815), and led the Third Army Corps at Ligny and at Wavre, contributing materially to the victory at Waterloo.

THIELT, tēlt. A town in the Province of West Flanders, Belgium, 20 miles southwest of Ghent (Map: Belgium, B 4). It has an ancient cloth hall and belfry and manufactures cotton and woolen goods, linen, leather, etc. In 1383 it was almost totally destroyed by fire, and has never regained its importance. Pop., 1900, 10,727; 1910, 11,605.

THIERRY, tyȧ'rē', Amédée (1797–1873). A French historian, born at Blois, brother of the following. He was associated with the Romantic school and especially with its journal, the *Globe*, and obtained a clerical post under the government in recognition of his contribution to the history of Guienne in 1825. His *Histoire des Gaulois* (1828) won for him a professorship of history at Besançon, but his teaching proved unpalatable to the reactionary government of Charles X and his course of lectures was suspended by official order. The revolution of 1830 brought to him the Prefecture of Haute-Saône, which he held till 1838, when he received the office of *Maître des requêtes*. In 1860 he was appointed Senator of the Empire. He was advanced to high office in the Legion of Honor and elected member of the Academy of Inscriptions in 1841. The most important of his books are: *Histoire de la Gaule sous l'administration romaine* (1840–47); *Histoire d'Attila* (1856); *Tableaux de l'empire romain* (1862); *Récits de l'histoire romaine* (1860–64). He wrote also *Saint-Jérôme* (1867) and *Chrysostome et Eudoxie* (1873).

THIERRY, Augustin (1795–1856). A French historian, born at Blois. He studied at the college of his native town and in the Ecole Normale at Paris, and became a teacher in a provincial school. In 1814 he went to Paris, and published his first work, *De la réorganisation de la société européenne*. Adopting the views of Saint-Simon, Thierry became his assistant for three years. In 1817 he joined Comte and Dunoyer as editor of the *Censeur Européen*, for which he wrote many articles, literary, political, and historical. In 1820 he became engaged on the *Courrier Français*, in which he published his *Dix lettres sur l'histoire de France*. He then turned almost exclusively to historical writing. His masterpiece, *L'Histoire de la conquête d'Angleterre par les Normands*, was first published in 1825. His *Lettres sur l'histoire* appeared in 1827. In 1835 he published his *Dix ans d'études historiques*. In 1840 appeared his *Récits des temps mérovingiens*, which gained the great Gobert prize. His last publication was the *Essai sur l'histoire de la formation et de progrès du tiers-état* (1853). He edited for Guizot's *Collection des monuments inédits de l'histoire de France* the *Recueil des monuments inédits de l'histoire du tiers-état* (1849–56). He died May 22, 1856. His complete works were published in 10 volumes (1856–60). His principal works have been translated into English. Consult Valentin, *Augustin Thierry* (Paris, 1895).

THIERS, tyȧr. The capital of an arrondissement in the Department of Puy-de-Dôme, France, 23 miles east-northeast of Clermont-Ferrand (Map: France, S., H 3). It is pleasantly situated on a hillside and consists of an upper and a lower town, the latter in a nearly sunless gorge (the Ville Noire of George Sand's novel of that name). The eleventh-century Romanesque Gothic church of Saint-Genès contains a noteworthy tomb of the thirteenth century, and the church of Le Moûtier is an interesting Romanesque structure founded in the seventh century. The town is noted for its manufactures of cutlery, buttons, paper, and playing cards. Pop., 1901, 17,625; 1911, 17,437.

THIERS, tyâr, ADOLPHE (1797–1877). A French statesman and historian, born at Marseilles, April 15, 1797. He was distinguished as a student at the lycée, and in 1815 he went to Aix to study law. There he formed a friendship with Mignet, the historian, in company with whom, after he had taken his degree as advocate (1818), he set off for Paris. Obtaining an introduction to Lafitte, he was enrolled among the contributors to the *Constitutionnel*, then the leading Liberal organ. His vigorous articles attracted attention and won him a place in the most brilliant circles of the Opposition. His *Histoire de la révolution française* (1823–27) gave him high rank as an historian. In January, 1830, he, with Mignet and Armand Carrel, established an able Opposition paper, the *National*. Thiers in this journal waged unrelenting war against the Polignac administration, whose publication of the celebrated Ordinances of July brought on the revolution of 1830. Under the new government of Louis Philippe Thiers was elected a member of the Chamber of Deputies, where he quickly made his mark as a debater, was appointed to a secretaryship in the Department of Finance, and in October, 1832, was made Minister of the Interior. During the next four years he acted as Minister of the Interior, Minister of Commerce and Public Works, and Minister of Foreign Affairs under various chiefs—Soult, Gérard, Mortier, and Broglie. His views became more conservative, and he repressed with severity the democratic uprisings against the new government. In February, 1836, he became President of the Council and Minister of Foreign Affairs, but in August retired when the King refused to approve his plan for intervention in Spain and became Opposition leader. In March, 1840, he again assumed the premiership and the Ministry of Foreign Affairs. He wished to support Mehemet Ali (q.v.) in his struggle against the Sultan, thus seeking to carry out the Napoleonic idea of a controlling influence by France in Syria and Egypt. He therefore refused to enter the alliance of Western powers formed for the preservation of the Ottoman Empire. (See QUADRUPLE ALLIANCE.) When Mehemet Ali was driven out of Syria, popular irritation in France, fostered by Thiers, was great, but Louis Philippe refused to countenance armed interference, as he had done in the Spanish matter, and accepted Thiers's resignation, October, 1840. The next five years Thiers spent in travel and in work upon his second history, *L'Histoire du consulat et de l'empire* (1845–62). After 1846 he again became active politically, and appeared frequently in the Chamber as an eloquent spokesman of the Opposition. In the revolution of 1848 his part was that of a Moderate friendly to the Republic. He was banished after the coup d'état of 1851, but in 1852 was permitted to return to Paris.

Thiers entered the Corps Législatif in 1863, and became the leader of the Liberal opposition, assailing the Imperial policies in a series of masterly speeches. He eloquently opposed the war with Prussia and predicted the defeat of France. After the collapse of the Empire he became the brains of the rehabilitation of France. He undertook diplomatic journeys to England, Russia, Austria, and Italy, on behalf of France—a self-imposed mission in which he was unsuccessful, but he acquired the gratitude of his countrymen. After the capitulation of Paris Thiers was elected to the National Assembly by 26 constituencies, and on Feb. 17, 1871, became chief of the executive power in the provisional government, and as such negotiated the treaty of peace with Germany. Upon the outbreak of the War of the Commune (q.v.) Thiers took swift and energetic measures for its suppression. On Aug. 31, 1871, the National Assembly conferred upon him the title of President of the Republic, making his term of office three years. Thiers, contrary to the expectations of the monarchical parties, became convinced of the need of a republican form of government, and in November, 1872, sent to the National Assembly a message urging the necessity of formulating an organic instrument of government for the Republic. The Clericals and Monarchists thereupon decided upon his fall, and, as the result of a vote of censure passed on the ministry, Thiers resigned May 24, 1873. He retired from public life for some time, but in 1876 was elected from Paris to the Chamber of Deputies, exercising his influence to the last in the defense of the Republic against Monarchist plots.

Thiers was perhaps the most influential political leader France has produced. His figure was small, his appearance far from impressive, and his early attempts at oratory are said to have been ridiculous, but when he adopted the rapid, incisive style adapted to his personality he became a most effective speaker. His course as a statesman was guided by an intense love of country, bordering on Chauvinism, and the conviction that the political power should repose in the hands of the middle class whose interests and tastes he so well represented. His histories are merely brilliant eulogies of the Revolutionary and Napoleonic ideals. He was elected a member of the Academy in 1834. His *Notes et souvenirs* were published in Paris in 1907.

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THIERSCH, tĕrsh, FRIEDRICH (1784–1860). A German classical scholar, born at Kirchscheidungen, and educated at Leipzig and Göttingen. In 1809 he was appointed professor in the newly established Gymnasium in Munich, where he became the founder of philological studies in Bavaria. The Philological Institute established by him was joined to the University of Munich in 1826. As a result of his sojourn in Greece, in 1831–32, he published his important work *De l'état actuel de la Grèce, etc.* (1833). He was a prime mover in establishing in 1837 regular meetings of German philologists and teachers. In 1848 he became president of the Bavarian Academy of Sciences. His writings include: *Griechische Grammatik* (3d ed., 1828); *Pindar* (1820); *Ueber die Epochen der bildenden Kunst unter den Griechen* (2d ed., 1829); *Allgemeine Aesthetik in akademischen Lehrvorträgen* (1846); and many works on education. Consult his biography by his son Heinrich (Leipzig, 1866); J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

THIERSCH, KARL (1822–95). A German surgeon, born at Munich, the son of the philologist Friedrich Thiersch (1784–1860). He studied in Munich, Berlin, Vienna, and Paris, and was a pupil of Stromeyer (q.v.). In 1854 he became professor of surgery at Erlangen and in 1867 at Leipzig. In the Franco-German War of 1870–71 he served as consulting surgeon. Thiersch is known through his work in skin grafting and in epithelial cancer. Moreover, he was one of the first continental surgeons to accept the teachings of Lister, and with others he introduced salicylic acid in the treatment of wounds. Among his works is *Der Epithelialkrebs namentlich der Haut* (1865).

THIERSCH, LUDWIG (1825–1909). A German decorative and historical painter. He was born in Munich and studied at the Munich Academy. After visiting Rome he was for three years professor at the Industrial Art School at Athens, where he was engaged by the Russian government to fresco the church of St. Nicodemus. He received similar commissions for the Greek church in Vienna, the chapels of the Grand Dukes Nicholas and Michael, and the Protestant church of St. Catharine at St. Petersburg (1860–64) and for the Greek churches in Karlsruhe (1864), London (1880), and Paris (1892).

THIES PROCESS. See CHLORINATION.

THIETMAR, tĕt′mär, Bishop of Merseburg (975 or 976–1018). A German chronicler of aristocratic family, related to the Emperor Henry II. Thietmar was educated in the cloister schools at Quedlinburg and Magdeburg, was created in 1002 Provost of Walbeck, shared in the campaign of 1007 against Boseslav of Poland, and in 1009 was made Bishop of Merseburg. He passed the remainder of his life for the greater part at court and sharing in campaigns against the Slavs. His *Chronicon* covers in eight books the period from Henry I (the Fowler) to 1018, and the last three books are almost a diary. It is rough and inflated in diction, credulous in narration, but shows an earnest search for truth, and is the principal source of history for the Trans-Elbian Slavic districts during the period it covers. The best edition of the *Chronicon* is by Kurtz in *Scriptores Rerum Germanicarum* (Hanover, 1889), in the *Monumenta Germaniæ Historica*. It was translated by Laurent (Berlin, 1848, and Leipzig, 1892). Consult Kurze, *Bischof Thietmar von Merseburg und seine Chronik* (Halle, 1890).

THIGH. The portion of the lower extremity which extends from the hip to the knee. The muscles of the front of the thigh are tensor fasciæ femoris, sartorius, and quadriceps extensor, the last of which is a powerful group of four muscles (rectus, crureus, and the two vasti) which are inserted below into the patella, or kneecap, and whose action is to strengthen the knee, thus being a most important factor in the preservation of the erect position and in locomotion. The muscles of the back of the thigh are biceps, semitendinosus, and semimembranosus, also called the hamstring muscles. Their action is to flex the leg on the thigh, to support the pelvis upon the head of the femur, or thigh bone, and to draw the trunk backward. On the inner side of each thigh is a group of adductor muscles, whose action is to bring the knees together. There is but one bone in the thigh, the femur, which articulates with the pelvis above and with the tibia below. The most important structures of the thigh lie in the triangle of Scarpa (q.v.). This is bounded above by Poupart's ligament, which is the base of the triangle, internally by adductor longus, and externally by sartorius. The great femoral artery and vein pass through the triangle, dividing it into nearly equal parts, the artery giving off here the profunda femoris and the vein receiving the long saphenous. The anterior crural nerve lies to the outer side of the artery. Femoral hernia appears in Scarpa's triangle, and not infrequently the extremity of a fistula running from Pott's disease of the spine appears in this space.

THIG′MOTAX′IS. See TROPISM, *Stereotropism.*

THIGMOT′ROPISM, or HAPTOTROPISM (from Gk. *θίγμα*, *thigma*, anything touched + *τροπή*, *tropē*, a turning, from *τρέπειν*, *trepein*, to turn). The sensitiveness of organisms to stimuli by contact, especially to prolonged contact with solid substances. The responses in plants depend chiefly upon a modification of the growth of the organs concerned. It is especially marked in tendrils. Other examples are to be found in the similar curvatures of the petioles of leaf climbers, and in the stems of dodder. See GROWTH; TROPISM, *Stereotropism.*

THIL′LY, FRANK (1865–). An American educator, born in Cincinnati, Ohio. He graduated at the university of his native city in 1887 and then studied at Berlin and at Heidelberg. He was professor of philosophy at the University of Missouri (1893–1904), of psychology at Princeton (1904–06), of philosophy at Cornell (from 1906), where he also became dean of the Arts College. He was editor of the *International Journal of Ethics* (from 1909) and president of the American Philosophical Association (1912). His publications include: *Leibnitz's Controversy with Locke* (1891); *Introduction to Ethics* (1900); *Process of Inductive Inference* (1904); *A History of Philosophy* (1914); and translations of Weber's *History of Philosophy* (1896) and Paulsen's *Introduction to Philosophy* (1885) and *System of Ethics* (1899). He contributed to the NEW INTERNATIONAL YEAR BOOK.

THING. See FIERDING COURT.

THI′OAL′COHOLS. See MERCAPTANS.

THI′OCYAN′IC ACID. See SULPHOCYANIC ACID.

THIONVILLE, tē′ôɴ′vēl′. See DIEDENHOFEN.

THIOSINAMINE, thī′ō-sĭn-ăm′ĭn *or* -ēn. A substance prepared by heating together oil of mustard 3 parts, alcohol 3 parts, and ammonia

6 parts, and known chemically as allyl-sulphocarbamide. It occurs as colorless crystals, soluble in alcohol and ether and to some extent in water, with a bitter-sweetish taste, and a faint odor of garlic. Its main use in medicine is in the removal of scar tissue wherever found. Thus it is indicated in corneal opacities, keloid, deafness due to thickening of the tympanic membrane or fixation of the ossicles. Where possible it is best given by hypodermic injection, but it is also said to be moderately efficient when given by mouth or applied locally in solution. Combined with sodium salicylate it is believed to act more satisfactorily and to give less pain when injected.

THI'OSULPHU'RIC ACID (from Gk. *θεῖον*, *theion*, sulphur + Eng. *sulphuric*), $H_2S_2O_3$, less properly hyposulphurous acid. An acid compound unknown in the isolated state and but little known in the form of dilute aqueous solutions, but well known in the form of its salts, called thiosulphates (or hyposulphites), especially its sodium salt. The thiosulphates are formed by the action of metals (such as zinc, iron, etc.) on acid sulphites. The thiosulphates of the alkalies are freely soluble in water; those of the alkaline earths are much less soluble; while those of the heavy metals are by themselves insoluble, but generally form soluble double compounds with the thiosulphates of the alkalies. The thiosulphate of sodium may be prepared in the laboratory by boiling a solution of sodium sulphite with sulphur. It may also be made from the thiosulphate of calcium. The latter is produced by the action of sulphur on lime. Hence it is produced (along with calcium pentasulphide) when lime is used for the purification of illuminating gas. Further, it is formed when a solution of calcium pentasulphide is exposed to the oxidizing action of the air—a reaction causing the production of the thiosulphate in the manufacture of soda (q.v.) and its increased production in the purification of illuminating gas. Aqueous sodium thiosulphate has the remarkable property of dissolving the halogen salts of silver, mercurous chloride (calomel) and iodide, the iodide and the sulphate of lead, the sulphate of calcium, and the oxides of copper. Owing to its capacity for dissolving the halogen salts of silver unaltered by light, it is extensively used in photography. It is further employed in the manufacture of certain coal-tar colors and in dyeing.

THIRD. See INTERVAL.

THIRD ESTATE (Fr. *tiers état*). See FRANCE; FRENCH REVOLUTION; STATES-GENERAL.

THIRL'WALL, NEWELL CONNOP (1797–1875). An English historian and bishop, born in London. He studied at Charterhouse School and graduated at Trinity College, Cambridge, in 1818. In 1820 he entered Lincoln's Inn and was called to the bar in 1825, but this profession was distasteful and he spent the years until 1828 in travel and literary pursuits, publishing translations of tales from Tieck and Schleiermacher's *Critical Essay on the Gospel of St. Luke* (1825). In 1827 he took up his residence in Cambridge, and until 1834 held various offices in the university when he was called upon to resign his appointment as assistant tutor on account of a pamphlet, *Letter on the Admission of Dissenters to Academical Degrees.* He accepted a living at Kirby Underdale in Yorkshire, where he wrote his *History of Greece* (1835–44). In 1840 he was appointed Bishop at St. David's in Wales; in 1874 he resigned his see and retired to Bath, where he died. With J. C. Hare he translated *Niebuhr's History of Rome* (1828–32). His *Remains, Literary and Theological*, and *Essays, Speeches, and Sermons* were edited by J. J. S. Perowne (London, 1877–80); his *Letters to a Friend*, with a memorial sermon, was edited by Dean Stanley (ib., 1882), and his *Letters, Literary and Theological*, with a *Memoir*, by Perowne and Stokes (ib., 1881).

THIRST (AS. *þurst*, *þyrst*, Ger. *Durst*, thirst; connected with Lat. *torrere*, to parch, Gk. *τέρσεσθαι*, *tersesthai*, to become dry). A sensation normally due to a lack of water in the tissues of the body. Although the sensation of thirst is referred principally to the mouth and throat, it is not a purely local feeling and can be satisfied by the introduction of fluid into the circulation through various channels. Water may be absorbed and thirst relieved by transfusion of saline solution into the veins, by injection into the tissues (hypodermoclysis), and to a less extent by absorption from the skin, as well as by drinking. In a state of thirst, the body fluids become reduced in volume, and of higher specific gravity and more saline, and these conditions explain the craving for water. Thirst is occasioned physiologically by profuse perspiration from exercise—especially in a warm, dry atmosphere—by a highly seasoned diet, by smoking, or by salty food. Many morbid conditions give rise to thirst; it is always an accompaniment of fevers and inflammations; diseases which, like cholera asiatica, diabetes, and diarrhœa, are characterized by great loss of fluid from the body, are thirst-producing. Loss of blood brings on a craving for liquids. As an exception to the rule that fevers demand drink, it may be noted that in typhoid fever thirst is sometimes blunted or suppressed. Thirst is most effectively relieved by slightly acidulated drinks, these provoking an outflow of saliva.

THIRTY-NINE ARTICLES OF RELIGION, THE. See ARTICLES, THE THIRTY-NINE.

THIRTY TYRANTS. 1. A body of rulers in Athens, invested with sovereign power after the close of the Peloponnesian War, 404 B.C. They were all native Athenians, chosen by the Spartan conquerors, who, knowing the animosity existing between the democracy and the oligarchy of Athens, hoped to rule the city through the agency of the latter. One of the most unscrupulous members of the body was Critias (q.v.), while Theramenes (q.v.) headed the moderate division. Their rule, after a year, was overthrown by Thrasybulus (q.v.). 2. The petty usurpers who sprang up during the reign of the Roman emperors Valerian and Gallienus (q.v.) (254–268 A.D.). They endeavored to establish themselves as independent princes. In reality, historians can only reckon 19—Cyriades, Macrianus, Balista, Odenathus, and Zenobia, in the East; Postumus, Lollianus, Victorinus (with his mother, Victoria), Marius, and Tetricus, in the West; Ingenuus, Regillianus (more properly Regalianus, as the name appears on coins), and Aureolus, in Illyricum and the countries about the Danube; Saturninus, in Pontus; Trebellianus, in Isauria; Piso, in Thessaly; Valens, in Achæa; Æmilianus, in Egypt; and Celsus, in Africa.

THIRTY YEARS' WAR. The name given to the great European struggle (1618–48) which marked the climax of the Reformation (q.v.), closing the period of distinctively religious politics and opening that in which secular statecraft replaced it. The Religious Peace of Augsburg (1555) afforded no permanent settlement of the questions stirred up by the Protestant revolution. Its terms recognized only Lutherans and Catholics; meanwhile the Calvinists had grown strong, and, unfortunately for the Protestant cause, violent enmity existed between them and the Lutherans. The relations of the Emperor and the German princes were ill-defined, and little real adjustment had been reached. France had already separated her natural interests from the affiliations of religion and aided the German Protestant princes in their insubordination towards their Imperial Catholic head. The Reformation, by overthrowing the idea of Christ's unity in the Church, broke down the theory of a Holy Roman Empire and put forward in its place the Germanic idea of autonomy for individual states. In the turmoil of sixteenth-century Europe it was inevitable that the solvent for these and other issues should be found in a general war. The outbreak came in an unexpected way. The liberal reign of Maximilian II (1564–76) was favorable to the growth of Protestantism in the Austrian dominions. His successor, Rudolph II (1576–1612), brought in the reactionary Jesuit influence and allowed full play to the forces of the Counter Reformation. Open interference with the practice of the Protestant religion was permitted and numbers of Protestant churches were destroyed. In 1607 Maximilian I, the Catholic Duke of Bavaria, made himself master of the free Imperial city of Donauwörth, whose inhabitants were mainly Protestants. A number of Protestant princes and cities founded in 1608 the Evangelical Union for the defense of their interests and their faith, and this was met by the formation of the Catholic League under the leadership of Maximilian of Bavaria in 1609. In that year the Emperor was forced to publish his *Majestätsbrief*, by which the Protestants of Bohemia were guaranteed free exercise of their religion. At this time the political state of the Empire was further unsettled by the Jülich-Cleves war of succession. (See JÜLICH.) In 1612 the Emperor Rudolph II died and was succeeded by his brother Matthias, to whom the Archduchy of Austria, Moravia, Hungary, and Bohemia had previously been transferred as a result of Rudolph's reckless rule. In 1617 the Bohemian estates were called upon to crown, as their prospective King, Duke Ferdinand of Styria, the Hapsburg heir presumptive, in accordance with a custom which had become established. Ferdinand had made himself prominent by the relentless manner in which he had rooted out Protestantism in his paternal Styrian dominions. His attitude encouraged the Catholic church in Bohemia in its aggressions, and soon a dispute regarding the interpretation of the *Majestätsbrief* brought on open conflict. On May 23, 1618, a body of Protestants, led by Count Thurn, entered the royal palace of Prague, and hurled two odious representatives of the crown, Martinitz and Slavata, from its windows. This defenestration, the victims escaping with their lives, inaugurated a struggle which was to convulse Europe for 30 years.

The Bohemians rose under Thurn, and the insurrection spread into adjoining Hapsburg dominions. A body of troops of the Union, under Count Mansfeld, appeared, and Bethlen Gábor, Prince of Transylvania, prepared to make war on Austria. Matthias was unprepared to meet the onslaught. Spain came to his aid, but the Spanish force was too weak to stay the advance of the enemy. The Emperor died in March, 1619, and Ferdinand, succeeding as the head of the house of Hapsburg, found himself beleaguered in Vienna by the victorious Thurn. Through firmness he succeeded in averting the fall of his capital, and made his way to Frankfort, where he was elected Holy Roman Emperor as Ferdinand II (August, 1619). The Bohemians, having declared their throne vacant, crowned the Elector Palatine Frederick V, the son-in-law of James I of England. Ferdinand, whose capital was in the meanwhile again threatened, this time by the Prince of Transylvania, was enabled to attack Frederick by means of the forces of the Catholic League, whose leader, Maximilian of Bavaria, was offered a rich indemnity. John George, Lutheran Elector of Saxony, eager for territorial acquisitions, entered the field against the Bohemians, while the Spaniards invaded the Lower Palatinate. The Protestant Union dared not move, and James I kept aloof from Frederick. On Nov. 8, 1620, a battle was fought at the White Hill, before the walls of Prague, in which the army of the League, under Tilly, was completely victorious. Frederick fled from Bohemia, which was chastised in a fearful manner by the Emperor, and forced back into the fold of the Catholic church. The dissolution of the Evangelical Union ensued. The cause of the Elector Palatine, however, whose hereditary dominions, the Upper and the Lower Palatinate, were assailed, found intrepid champions in Mansfeld and Christian of Brunswick, lawless partisan leaders. George Frederick, Margrave of Baden-Durlach, also took up arms for Frederick, and with Mansfeld gained a victory over Tilly at Wiesloch on April 27, 1622. On May 6, however, the former was vanquished by Tilly at Wimpfen; June 20 a like disaster befell Christian of Brunswick at Höchst. On Aug. 6, 1623, Christian of Brunswick sustained a second defeat by Tilly at Stadtlohn. Frederick was stripped of his possessions. The Upper Palatinate and the electoral dignity were conferred on Maximilian of Bavaria.

The war might have ended with this local struggle, but the outrageous treatment to which the Protestant states of north Germany were subjected pressed the conflict on to its second phase. Christian IV of Denmark, aided by a British subsidy, went to the aid of his German coreligionists in 1625, and, being joined by Mansfeld and Christian of Brunswick, advanced into Lower Saxony, while the Emperor, hampered by the political jealousy of the Catholic League, was at first unable to oppose him. It was at this juncture that Wallenstein came forward and placed a great army, raised by himself, at the disposal of Ferdinand. This army acted in coöperation with that of the Catholic League under Tilly. Mansfeld was completely defeated by Wallenstein at Dessau (April 25, 1626), and the forces of Christian IV were routed by Tilly at Lutter (Aug. 27, 1626). Wallenstein marched as far as Hungary in pursuit of Mansfeld, who died in November, 1626. The combined Imperialists and Leaguers overran north Germany and Wallenstein penetrated into the heart of Denmark. The Imperialist commander conceived the design of making Austria a power on the Baltic, but his career in this direction was checked by the heroic defense of Stralsund (1628). King Christian was forced to conclude the humiliating peace of Lübeck (May 12, 1629). Inflamed by success, Ferdinand had, on March 6, 1829, issued the Edict of Restitution, by which the Protestant titles to all ecclesiastical lands acquired after 1552 were declared void. Thus closed the second period of the war, with the Protestant States infuriated by the edict and the proud city of Magdeburg alone in arms to resist its execution.

Richelieu (q.v.), developing the anti-Hapsburg policy of Henry IV, had promoted, as far as the internal affairs of France would allow, dissension in Germany. He now succeeded in bringing into the struggle the able and ambitious Protestant King of Sweden, Gustavus Adolphus (q.v.). This ruler, desirous of promoting Protestantism and of securing control of the Baltic, took the field, and the Swedish phase of the war began with the landing of the Swedes on the coast of Pomerania in the summer of 1630. Just at this time the princes of the Catholic League, exasperated by the overbearing conduct of Wallenstein and the excesses of his soldiery, forced the Emperor to dismiss him, Tilly being made commander in chief of the Catholic forces. Gustavus Adolphus, who in January, 1631, entered into a subsidiary alliance with France, advanced southward into Germany. The electors of Saxony and Brandenburg at first remained neutral, but finally were forced to join him. The obstacles in his path delayed him until it was too late to rescue Magdeburg, which on May 20, 1631, was stormed by Tilly and Pappenheim, whose troops burned the town and massacred the inhabitants. On Sept. 17 (O.S., Sept. 7), 1631, the Swedish King, strengthened by the Saxon army under Arnim, overwhelmed Tilly at Breitenfeld, near Leipzig, a victory which completely restored the Protestant cause. He then victoriously traversed the Main and Rhine valleys; forced the passage of the Lech in front of the army of Tilly, who was mortally wounded (April 15, 1632); entered Munich, and threatened the Hapsburg dominions. Wallenstein, meanwhile, had been recalled to raise and command the Imperialist armies to meet this formidable enemy. He compelled the Swedes by skillful strategy to return to Saxony. There the Swedes won the battle of Lützen (q.v.), Nov. 16 (O.S., Nov. 6), 1632, after an obstinate engagement in which Gustavus was killed. His death was a severe blow to the Protestant cause, but the energy and ability of the Swedish Chancellor, Oxenstierna (q.v.), and the brilliant talents of the Swedish generals, preserved the advantages that had been gained. After the battle of Lützen Wallenstein remained long inactive, engaging in endless negotiations. Bernhard (q.v.) of Saxe-Weimar, one of the ablest of the Protestant leaders, overran Bavaria, and on Nov. 14, 1633, stormed Ratisbon. The behavior of Wallenstein, after a display of activity, inaugurated by a victory over the Swedes at Steinau, Oct. 13, 1633, finally left no doubt in the mind of Ferdinand II that his general was meditating treason. He was deposed from his command and was assassinated at Eger in Bohemia, on Feb. 25, 1634. His virtual successor, Gallas, inflicted a crushing defeat on Bernhard of Weimar and the Swedish general, Horn, at Nördlingen (Sept. 6, 1634), which again restored to the Emperor a preponderating influence in Germany. Saxony now made peace at Prague (May 30, 1635), the Elector securing important territorial gains. Other Lutheran states withdrew from the conflict, the Calvinists being left to their fate.

Final success now appeared to demand only one more strenuous effort on the part of Austria; but Oxenstierna was determined to preserve to Sweden her German acquisitions, and Richelieu saw that the time had come for France to throw herself into an active struggle against both Austria and Spain. The conflict advanced into its final and most extended phase. At first the Hapsburg side was enabled to make a show of strength, France being invaded by a combined force of Spaniards, Imperialists, and Lotharingians, but with such commanders on their side as Bernhard of Weimar and the Swedish general Banér, the tide soon set strongly in favor of the Protestants. The victory of Banér over the Imperialists and Saxons at Wittstock (Oct. 4, 1636) restored to Sweden the advantage lost two years before. Bernhard of Weimar, in the pay of France, fought with energy and success, ambitious to found a state for himself. In 1638 he won a victory at Rheinfelden and reduced the fortress of Breisach, but in the following year he met untimely death. In February, 1637, Emperor Ferdinand II died and was succeeded by his son, Ferdinand III. After the death of Banér in 1641, the Swedish arms were led to fresh triumphs by Torstenson, a general famous for the rapidity of movement. He defeated the Archduke Leopold William and Piccolomini at Breitenfeld Nov. 2, 1642; in 1644 he overran Denmark, whose ruler, Christian IV, had been induced to take up arms against Sweden; in the same year he defeated Gallas at Jüterbock; and on Mar. 6, 1645, he won a great victory over the Imperialists, under Hatzfeld, at Jankau, southern Bohemia. His repeated invasions carried devastation and ruin into the territories, even to the gates of Vienna, until the Austrians hardly dared appear north of the Danube. Meanwhile, in the west and south, the French were waging war with varying success. In January, 1642, they were successful at Kempen, near Düsseldorf, and in May, 1643, the Duke d'Enghien (the future Condé) won a signal victory over the Spaniards at Rocroi, but on Nov. 24, 1643, the French-Weimar forces suffered a great defeat at Tuttlingen, in Swabia, at the hands of Johann von Werth and Mercy. Condé and Turenne restored the fortunes of the French by a victory at Allersheim, near Nördlingen, Aug. 3, 1645. The Emperor was now deserted by all his allies except the Duke of Bavaria, whose territories were already mostly in the hands of Turenne and the Swedish general Wrangel; and a combined invasion of Austria from the west and north was on the point of being executed, when the diplomatic representatives of the different governments, who had been at work for seven years at Münster, in Westphalia, and at Osnabrück, agreed upon terms of peace which closed the struggle. See WESTPHALIA, PEACE OF.

Aside from the political disintegration of Germany which resulted, the 30 years' struggle had brought desolation upon the country. Scarcely any part of the Empire had escaped the horrors of the conflict, the people had been made the victims of a licentious soldiery whose excesses long remained in popular memory. Whole regions were laid waste, prosperous towns wiped out, commerce and industry destroyed. Germany lost half of her population and two-thirds of her wealth; in Bohemia, the decrease in population rose to two-thirds or more. Religion and morality sank to a low ebb, and the loss entailed on the intellectual side was one which it took generations to make good.

Consult: S. R. Gardiner, *The Thirty Years' War* (London, 1874); Anton Gindely, *Geschichte des dreissigjährigen Kriegs* (4 vols., Prague, 1869–80; Eng. trans. by A. Ten Brook, New York, 1884); "The Thirty Years' War," in *Cambridge Modern History*, vol. iv (New York, 1906), containing a comprehensive bibliography; J. C. F. von Schiller, *History of the Thirty Years' War in Germany* (Sterling ed., Boston, 1910). Consult also references under Gustavus Adolphus; Richelieu; Wallenstein; etc.

THISBE. See Pyramus and Thisbe.

THISTLE (AS. *þistel*, OHG. *distula*, *distil*, Ger. *Distel*, thistle). A popular name for various plants of the family Compositæ. They usually have stout, spiny-tipped herbage or flowering bracts. They are widely distributed, mostly as weeds. In the United States the name applies to the species of *Cnicus*, *Cirsium*, *Carduus*, *Onopordon*, *Silybum*, *Centaurea*, and *Sonchus*. By some botanists the first two genera are combined under the name *Cnicus*. The principal distinction between these two is that *Cirsium* has plumose pappus and hence is often called plume thistle, while *Cnicus* has bristly pappus. The species belonging to the other genera are all introduced from the Old World. The pasture thistle (*Cirsium pumilum*), yellow thistle (*Cirsium spinosissimum*), bull thistle (*Cirsium lanceolatum*), and others are common and troublesome in pastures and on roadsides. *Cirsium arvensis*, the so-called Canada thistle, a European species, is one of the most troublesome and difficult to eradicate of all. It is a slender perennial, 1' to 3 feet high, with rather small, rose-colored flowers. It spreads principally by its spreading rootstocks, but can be eradicated by persistent cultivation. The heads are imperfectly diœcious and not all produce seed. Among the other common European thistles found in the United States is the milk thistle (*Silybum marianum*), a biennial plant 4 to 6 feet tall. The leaves are sometimes used as salads, or as potherbs. The roots, for which it was formerly cultivated, were used like salsify. The blessed thistle (*Cnicus benedictus*), native of Asia, was formerly considered to have medicinal properties. It resembles the star thistle (*Centaurea*), of which there are many species, the best known of which are *Centaurea calcitrapa* and *Centaurea cyanus*, the blue-bottle or bachelor's button. The cotton or Scotch thistle (*Onopordon acanthium*) is recognized by its deeply honeycombed receptacle and cottony or woolly leaves. It is said to be the emblem of Scotland, but *Cirsium acaulis*, a stemless thistle common in Scotland, seems more worthy this designation. The Carline thistle (*Carlina vulgaris*) is a rather troublesome weed in poor soils in Europe, and was named Carline thistle because Charlemagne, according to tradition, used its roots as a cure for the plague. Species of *Sonchus* are called sow thistle, of which three are found in the United States, *Sonchus oleraceus*, the common sow thistle, *Sonchus asper*, the spiny leaved sow thistle, and *Sonchus arvensis*, the field sow thistle. Other plants of different families are sometimes called thistles, as species of *Dipsacus* (see Teasel) and blue thistle (*Echium vulgare*), the latter belonging to the family Boraginaceæ. See Plate of Tansy, etc.

The so-called Russian thistle is *Salsola tragus*, a plant related to the saltwort. It was introduced into America some years ago in flax seed, and was for a time a very troublesome weed in the western United States. Its name thistle came from the spiny leaves and stems.

THISTLE. A steel yacht built in 1887 at Glasgow. She lost the contest for the America's cup to the *Volunteer*, and afterward became the property of the German Emperor under the name of *Meteor*. See Yachting.

THISTLE, Order of the; less commonly Order of Saint Andrew. A Scottish order having the year 787 as the mythical date of its foundation. It was established by James V in 1540, reorganized by James II of Great Britain in 1687, and a second time reconstituted by Queen Anne in 1703. The statute of 1827 limits the number of knights to 16 members of the Scottish nobility, in addition to the sovereign and princes of the blood. The star of the order is of silver with a round gold plaque bearing a thistle on a green field. The ribbon is green. The motto runs, *Nemo me impune lacessit*.

THISTLE BIRD. See Goldfinch, 2.

THISTLEWOOD CONSPIRACY, or Cato Street Conspiracy. A plot against the British government formed in 1819–20 by Arthur Thistlewood (1770–1820). It was planned to murder the Ministers at a dinner given by Lord Harrowby on Feb. 23, 1820, to seize the Mansion House, attack the Bank of England, and to set fire to London in several quarters. All of Thistlewood's intentions were, however, regularly reported to the authorities by one of his confidants, George Edwards. On Feb. 21, 1820, the conspirators hired a loft in Cato Street, and there they were arrested on February 23. Thistlewood escaped, but was captured the following day. He was found guilty on April 19, and hanged with four other conspirators.

THLINKITS, tliŋ'kits. See Alaska, *Population*.

THNETOPSYCHITES. See Intermediate State.

THO'AS (Lat., from Gk. *Θόας*). 1. The son of Dionysus and Ariadne. He was King of Lemnos and father of Hypsipyle (q.v.), who saved him when the men of the island were killed by the Lemnian women. 2. A King of Tauris. Artemis carried Iphigenia (q.v.) into his dominion after saving her from the sacrifice at Aulis.

THO'BURN, James Mills (1836–). An American Methodist Episcopal missionary bishop. He was born at St. Clairsville, Ohio, graduated at Allegheny College (1857), and was admitted to the Pittsburgh Conference (1858). From 1859 to 1908 (except for the years 1886–88) he was a missionary in India, becoming presiding elder of the Indian Conference, and for the last 20 years of the period being missionary Bishop of India and Malaysia. He published: *My Missionary Apprenticeship* (1887); *Missionary Addresses Before Theological Schools* (1887); *India and Malaysia* (1893); *Christless Nations: Graves Lectures at Syracuse University* (1895); *Light in the East* (1898); *The Christian Conquest of India* (1906); *India and*

Southern Asia (1907). Consult W. H. Crawford, *Thoburn and India* (New York, 1909).

THOLEN, tō′lėn. An island belonging to the Province of Zealand, Netherlands, 22 miles north by west of Antwerp (Map: Netherlands, C 3). It covers an area of about 47 square miles. The little town of Tholen is in the eastern part. Pop., 1899, 3076; 1909, 3254.

THOLUCK, tō′lụk, Friedrich August Gottreu (1799–1877). A German theologian, born in Breslau. He became professor extraordinary of theology at Berlin in 1823, and full professor at Halle in 1826, where he spent the remainder of his life with the exception of a sojourn in Rome in 1828–29. Tholuck was an influential preacher, writer, and teacher on behalf of a religion of experience. His most important work was exegetical. His commentaries on the Psalms, the Sermon on the Mount, John, Romans, Hebrews, have all been translated into English. His best-known works are *Die wahre Weihe des Zweiflers* (1823; 9th ed., 1870; Eng. trans., *Guido and Julius*, 1854); *Das Alte Testament im Neuen* (1836; 7th ed., 1877); and *Stunden christlicher Andacht* (1840; Eng. trans., *Hours of Christian Devotion*, New York, 1875). Among his other works may be mentioned *Lebenszeugen der lutherischen Kirche vor und während der Zeit des dreissigjährigen Krieges* (1859) and *Geschichte des Rationalismus* (1st part, 1865). Consult his *Life* by L. Witte (Bielefeld, 1884–86), and M. Kähler, *August Tholucks Gedächtnis* (Leipzig, 1899). His collected works were published at Gotha (11 vols., 1863–72).

THOM, tŏm, John Hamilton (1808–94). A Unitarian clergyman and author, born at Newry, County Down, Ireland, where his father was settled as a Presbyterian minister. He studied at the Belfast Academical Institution with a view to the Presbyterian ministry, but he was won over to Unitarianism by the writings of William Ellery Channing (q.v.). From 1831–54 and from 1857–66 he was minister of Renshaw Street Chapel, Liverpool. From 1854 to 1857 his place was taken by William Henry Channing (q.v.). Meanwhile (1838) he became editor of the *Christian Teacher* (afterward the *Prospective Review*). In company with Martineau he conducted a famous controversy with Anglican divines on the interpretation of the New Testament (1839). Besides a life (1845) of Joseph Blanco White, Thom published mainly *St. Paul's Epistles to the Corinthians* (1861); *Letters, Embracing his Life, by John James Tayler* (1872); *Laws of Life after the Mind of Christ* (1883). After his death appeared *A Spiritual Faith* (1895).

THOMA, tō′mȧ, Hans (1839–). A German painter, illustrator, and lithographer. With Feuerbach, Marées, and Böcklin, he became one of the leaders of modern painting in Germany. He was born at Bernau, in the Black Forest, and studied at the Karlsruhe Academy with Schirmer, at Düsseldorf (1867), and then in Paris, where he came under the influence of Courbet. Afterward he spent four years in Munich with Victor Müller, who also exerted a powerful influence upon him. His style, however, was formed chiefly on the old German wood engravers. After a visit to Italy he settled in Frankfort, and in 1899 removed to Karlsruhe, where he was appointed director of the gallery and professor at the Academy. His intense individuality and sometimes defective technique at first blinded the public to the freshness and richness of his color, the power and poetry of his imagination, and the depth of his sympathy with German life, but after the Collective Exhibition of German art at Munich in 1890 his true value began to be appreciated. His paintings cover a wide range—landscapes, portraits, genre scenes of German life, religious, mythological, allegorical, and purely fantastic subjects. He also did some work in lithography, etching, and illustration. His lithographs are strong, simple, and full of decorative value. His best-known paintings include: "A Spring Idyl" and "The Guardian of the Valley" (Dresden Gallery); "Solitude" (Munich Pinakothek); "On the Way to the Castle of the Grail" (Vienna Gallery); "At Lake Garda" (Metropolitan Museum, New York); "Longing" (1900); "Paradise" (1901); "Scenes from the Life of Christ" (1907–08, Karlsruhe Gallery). Consult: Fritz von Ostini, "Thoma," in *Künstler-Monographien*, vol. xlvi (Bielefeld, 1900); Franz Servaes, *Hans Thoma* (Berlin, 1900); M. Spanier, *Hans Thoma und seine Kunst* (Leipzig, 1903); and Henry Thode, in *Der Ring des Frangipani* (4th ed., Frankfurt, 1909).

THOMA, Ludwig (1867–). A German journalist and author, who used the pseudonym of Peter Schlemihl. He was born in Oberammergau, Bavaria, and studied law at Munich and Erlangen, practicing his profession for a time at Dachau and Munich. After 1899 he was editor of *Simplicissimus*. He is noted for his rather broadly humorous short stories and sketches, especially of Bavarian life, for his dramas and political satires. Among his writings, which went through many editions, are: *Agricola und andere Bauerngeschichten* (1897); *Assessor Karlchen und andere Geschichten* (1900); *Die Medaille*, a comedy (1901); *Die Lokalbahn*, a comedy (1902); *Lausbubengeschichten* (1904); *Andreas Böst*, a novel (1905); *Tante Frieda*, a tale (1906); *Moral*, a comedy (1909); *Der Wittiber*, a novel (1911); *Magdalena* (1912); *Das Säuglingsheim* (1913).

THOMAR, Count de. See Costa Cabral, A. B. da.

THOMAS, tŏm′*as* (Gk. Θωμᾶς, Aram. *Te'uma'*, from Heb. *Tōām*, twin). One of the Twelve Apostles. In the Synoptic Gospels and the Acts he is mentioned by this name in the lists of the twelve disciples (Mark iii. 18; Matt. x. 3; Luke vi. 15; Acts i. 13). In the Fourth Gospel, however, it is made apparent that this name is an appellative (John xi. 16; xx. 24; xxi. 2). In the Sinaitic Syriac manuscript John xiv. 22 reads "Thomas" instead of "Judas," which hints at an early identification of Thomas with Judas, the son of James. This identification appears also in the Syriac source from which Eusebius translated the story of King Abgar and Thaddæus, and in the apocryphal *Acts of Thomas*. The Fourth Gospel alone gives us any information of him beyond his name, disclosing him as one who was inclined to overestimate difficulties (xiv. 5) and to be troubled with doubts (xx. 24, 25), but, at the same time, as one whose loyalty to the Master made him willing to face whatever difficulties there were (xi. 16), and whose response to the Master's assurances changed his doubts into instant faith (xx. 26–28). Though nothing more is said of him in the New Testament, he figures prominently in the traditions concerning the spread of Christianity in the Far East. The

Syrian Abgar legend relates that it was he who sent Thaddæus, the Apostle of eastern Syria, to that country. A tradition older than Eusebius gives Parthia as his mission field; while another, embodied in the Gnostic *Acts of Thomas*, made him the Apostle of India. To him the "Thomas Christians" of southern India assign their origin. Mount St. Thomas, near Madras, is the place of his reputed martyrdom. As these Christians were closely connected with east Syrian Christianity, it is probable that the basis of the whole fabric of tradition is some actual missionary labor of the Apostle Thomas in eastern Syria. See Apocrypha; Christians of Saint Thomas.

THOMAS, Christians of Saint. See Christians of Saint Thomas.

THOMAS, Gospel of. See Apocrypha, *New Testament*.

THOMAS, A(lbert) E(llsworth) (1872–). An American playwright. He was born at Chester, Mass., and graduated from Brown University in 1894. From 1895 to 1909 he was engaged in newspaper work in New York on the staffs of the *Tribune*, *Evening Post*, *Times*, and *Sun*. Thomas wrote the novel *Cynthia's Rebellion* (1904), and the plays *Her Husband's Wife* (produced, 1910; published, 1914); *What the Doctor Ordered* (1911); *The Divorce Fund* (1911); *Little Boy Blue* (1911); *The Rainbow* (1912).

THOMAS, tô'mȧ', Ambroise (1811–96). A French operatic composer, born in Metz. In 1828 he entered the Paris Conservatory, studied under Zimmermann and Kalkbrenner (piano), and under Dourlen, Barbereau, and Le Suer (counterpoint, harmony, and composition). He won the Grand Prix de Rome in 1832. He succeeded Auber as director of the Conservatory in 1871. His chief success lay in opéra comique, the best example of which was *Mignon* (1866). His compositions include the operas: *Le panier fleuri* (1839); *Le Caïd* (1849); *Le songe d'une nuit d'été* (1850); *Psyché* (1857); *Hamlet* (1868); *Françoise de Rimini* (1882); ballets; cantatas; a requiem; and chamber music.

THOMAS, tô'mȧ', André Antoine (1857–). A French philologist and historian. He was born at Saint-Yrieux-la-Montaigne (Creuse), and was educated in Paris at the Ecole des Chartes and the Ecole des Hautes Etudes (1875–78), passing thence to the Ecole Française at Rome (1879–81). From 1881 to 1889 he taught in the faculty of letters, Toulouse, and thereafter in the University of Paris, rising to be professor of French literature of the Middle Ages and Romance philology. His work is characterized by a severe and careful method as well as a perspicacious originality. He came to be generally considered the leading lexicographical authority in France. In 1889 he founded at Toulouse the quarterly review *Les Annales du Midi*, of which he was editor until 1898. His most important publications are: *Les états provinciaux de la France centrale sous Charles VII* (2 vols., 1879); *Inventaire sommaire des archives communales de Limoges* (1882); *Nouvelles recherches sur l'entrée de Spagne* (1882); *Francesco da Barberino, étude sur la littérature provençale en Italie* (1883); *Poésies complètes de Bertran de Born* (1888); *Essais de philologie française* (1897); *Mélanges d'étymologie française* (1902); *Nouveaux essais de philologie française* (1904); *Le comté de la Marche et le parlement de Poitiers (1418–1436)* (1910); *Les registres de Boniface VIII* (3 vols., 1884–1911), with G. Digard and M. Faucon; *L'Entrée d'Espagne, chanson de geste franco-italienne* (2 vols., 1913). In collaboration with A. Hatzfeld and A. Darmesteter he published the *Dictionnaire général de la langue française* (2 vols., 1899–1900), a standard French lexicon. He became a member of the Institute of France and director of courses at the Ecole des Hautes Etudes.

THOMAS, tŏm'*as*, Augustus (1859–). An American playwright, born in St. Louis, Mo. He was a page in the Forty-first Congress, and subsequently, after studying law and gaining some experience in practical railway work, took to journalism, becoming editor and proprietor of the Kansas City *Mirror* in 1889. Subsequently he devoted himself wholly to playwriting. His *Alabama* (produced 1891) and *Arizona* (produced 1899; published 1904) were played both in America and England. Other plays include: *In Mizzoura*, *Colorado*, *The Man Upstairs*, *Oliver Goldsmith*, *The Earl of Pawtucket*, *The Other Girl*, *Mrs. Leffingwell's Boots*, *The Education of Mr. Pipp*, *Jim Delancey*, *The Embassy Ball*, *The Witching Hour*, *The Harvest Moon*, *As a Man Thinks* (published 1911), *Indian Summer*, *The Rio Grande*. A master in the technique of the drama, Thomas reaches a high artistic level in *Arizona* and *The Witching Hour*. A novelization of the latter appeared in 1908. He was elected to membership in the American Academy of Arts and Letters, was awarded the National Institute's gold medal in 1913, and in 1914 received an honorary A.M. degree from Williams College.

THOMAS, Brandon (1856–1914). An English actor and playwright, born in Liverpool. His first appearance on the stage was in 1879. His farce *Charley's Aunt* (1892) made a great hit, running for 1200 successive performances in London and afterward standing the strain of perennial revival. It was also translated into several languages, and proved a success abroad as well as at home. Other plays of Thomas's were: *Comrades* (1882), his first success; *The Colour Sergeant* (1885); *The Lodgers* (1887); *The Gold Craze* (1889); *The Lancashire Sailor* (1891); *Marriage* (1892); *22a Curzon Street* (1898); *Women Are So Serious* (1901); *Fourchette and Co.* (1904); and *A Judge's Memory* (1906).

THOMAS, Calvin (1854–). An American scholar, born near Lapeer, Mich. He graduated in 1874 at the University of Michigan, where, after studying philology at Leipzig, he became a member of the faculty, rising to be professor of Germanic languages and literature (1886–96). In 1896 he accepted the corresponding chair at Columbia University. Calvin Thomas was president of the Modern Language Association of America in 1896–97, and of the American Dialect Society in 1912–13. His publications include: *A Practical German Grammar* (1895; 4th ed., rev., 1905); *Goethe and the Conduct of Life* (1886); *The Life and Works of Schiller* (1901); *A History of German Literature* (1909). In addition he edited *Faust* (part i, 1892; part ii, 1897), *Hermann und Dorothea* (1891), and *Torquato Tasso* (1888), and *An Anthology of German Literature* (1909), and contributed to the New International Encyclopædia.

THOMAS, Charles Louis Ambroise. See Thomas, Ambroise.

THOMAS, Charles Spalding (1849-). An American legislator. He was born at Darien, Ga., graduated LL.B. from the University of Michigan in 1871, and practiced law at Denver, Colo., in 1871-79, at Leadville in 1879-85, and again at Denver after 1885. Thomas was a member of the Democratic National Committee from 1884 to 1896, and served as temporary chairman of the Democratic National Convention at Kansas City, Mo., in 1900. From 1899 to 1901 he was Governor of Colorado, and in 1913 was elected United States Senator for the unexpired term of Charles J. Hughes, being reelected for the term 1915-21.

THOMAS, Cyrus (1825-1910). An American anthropologist, born at Kingsport, Tenn. Admitted to the bar in 1851, he practiced law until 1865, when he became a minister of the Evangelical Lutheran church. He served as an assistant on the United States Geological Survey in 1869-73, as professor of natural science in the Southern Illinois Normal University in 1873-75, as State entomologist of Illinois in 1874-76, and as a member of the United States Entomological Commission in 1876-77. From 1882 until his death he was archæologist of the United States Bureau of Ethnology. He published: *Synopsis of the Acridida of North America* (1873); *Mound Explorations of the Bureau of American Ethnology* (1887); *Introduction to the Study of North American Archæology* (1898); *Indians of North America in Historic Times* (1903), with W J McGee; and a large number of bulletins on Indian languages, calendars, writings, and similar subjects.

THOMAS, David (1813-94). A British Congregational minister. He was born at Vatson, near Tenby, Wales; was educated at Newport-Pagnell (now Cheshunt) College; and from 1844 to 1877 was minister of the Stockwell Independent Church, London. The remainder of his life was spent in retirement. He was greatly admired as a preacher, and had a large circle of readers for his monthly, *The Homilist, or Voice for the Truth* (1852-82), and for his collection of writings called *The Homilist Library* (1882-89). He compiled a liturgy for Evangelical churches (1856), and a hymn book (1866), which contained some fair hymns of his own composition.

THOMAS, Edith Matilda (1854-). An American writer. She was born in Chatham, Ohio, and was educated at the normal school of Geneva, Ohio. She began writing early for the local newspapers, and was encouraged by Mrs. Helen Hunt Jackson in 1881 to send verse to more important periodicals. Her first volume appeared in 1885, entitled *A New Year's Masque and Other Poems*. Other books are: *The Round Year* (1886); *Lyrics and Sonnets* (1887); *Babes of the Year* (1888); *Babes of the Nation* (1889); *Heaven and Earth* (1889); *The Inverted Torch* (1890); *Fair Shadow Land* (1893); *In Sunshine Land* (1895); *In the Young World* (1895); *A Winter Swallow, and Other Verse* (1896); *The Dancers* (1903); *Cassia, and Other Verse* (1905); *Children of Christmas* (1907); *The Guest of the Gate* (1909); *The White Messenger, and Other War Poems* (1915).

THOMAS, George Henry (1816-70). A distinguished American soldier, born in Southampton Co., Va. He graduated at West Point in 1840; served in the Mexican War, and distinguished himself at Monterey and Buena Vista. After the close of the Mexican War he served a year in Florida, three years as cavalry and artillery instructor at West Point, and then for five years in Texas as major in the Second Cavalry. On the outbreak of the Civil War, though he was by birth and associations a Southerner, he adhered to the Union cause; was lieutenant colonel (afterward colonel) of the Second Cavalry; commanded a brigade in the first Shenandoah campaign; and early in 1862 won the battle of Mill Springs, Ky. He commanded the right wing of the Army of the Tennessee during the siege of Corinth, and was in full command during a great part of June, 1862. He held command of the centre of the Army of the Cumberland, and though appointed to supersede Buell as commander of the whole army, asked to remain in a subordinate position. He rendered conspicuous service at Perryville and Stone River (q.v.), and led the Fourteenth Army Corps in the campaign of middle Tennessee in the summer of 1863. At Chickamauga, Sept. 19-20, 1863, Thomas stood firm, and resisted the concentrated attack of a victorious enemy, gaining the title of "the Rock of Chickamauga." Soon after he reluctantly succeeded to the post held by Rosecrans, and commanded the Army of the Cumberland at Missionary Ridge, and in the campaign of 1864 up to the capture of Atlanta. When Sherman marched thence to the sea, Thomas was sent into Tennessee, where, in the battle of Nashville, Dec. 15-16, 1864, he crushed Hood's army. He was at once appointed a major general in the regular army, and Congress tendered him a vote of thanks. In 1865-66 General Thomas commanded the Military Division of the Tennessee, including Kentucky, Tennessee, Georgia, Alabama, and Mississippi, and the Department of the Tennessee, including the same States, in 1867. From June, 1869, until his death, he was in command of the Military Division of the Pacific, with headquarters at San Francisco. General Thomas was a man of sterling qualities, and a courageous and skillful officer. He enjoyed to a marked degree the loyalty of his men and the confidence of his superiors. Consult: T. B. Van Horne, *Life of Major General G. H. Thomas* (New York, 1882); Henry Coppée, *Life of General Thomas* (ib., 1893); Gamaliel Bradford, in *Union Portraits* (Boston, 1916).

THOMAS, Isaiah (1749-1831). An American printer, born in Boston, Mass. He was a printer at Newburyport in 1767, and in 1770, in partnership with his former employer, established the *Massachusetts Spy*, becoming sole editor at the end of three months, and conducting the paper first at Boston and then (after 1774) at Worcester until 1801. His paper became the organ of the Whig or Patriot party, and fearlessly attacked the measures of the British ministry. At Worcester and later at Walpole, N. H., he published a number of reprints of standard English works, besides Bibles, hymn books, school books then in general use, and a magazine, *The Farmers' Museum*. In 1788 he opened a bookstore and publishing house in Boston and (1789-1796) published *The Massachusetts Magazine*. He issued the *New England Almanac* (1775-1801), wrote an excellent *History of Printing in America* (1810), and founded (1812) the American Antiquarian Society, giving it his large library and a liberal endowment. Consult B. F. Thomas, *Memoir of Isaiah Thomas* (Boston, 1874), and "Diary of Isaiah Thomas, 1805-1828," edited by B. T. Hill, in American Antiquarian Society, *Transactions*, vols. ix, x (Worcester, 1909).

THOMAS, JOHN (1725–76). An American soldier, born at Marshfield, Mass. He studied medicine, and became eminent as a physician. In 1746 he served as surgeon in a regiment sent to Nova Scotia, and in 1747 acted first as surgeon and then as lieutenant under Shirley. In 1759 he became a colonel of provincials, and in 1760 led a regiment at Crown Point and was at the capture of Montreal. He was appointed a brigadier general in June, 1775, and a major general in the following March. During the siege of Boston he was stationed on the Roxbury side, and on the night of March 4, 1776, with 3000 men, occupied Dorchester Heights, thus rendering Boston untenable for the British, who evacuated it on the 17th. He then was appointed to succeed Montgomery in Canada, and took command before Quebec on May 1; but, finding the army small in numbers and weakened by disease, he ordered a retreat. Contracting the smallpox, he died near Montreal on May 30.

THOMAS, JOHN JACOB (1810–95). An American horticulturist and writer. He was born near Lake Cayuga, in central New York, and there spent his life on a farm. For nearly 60 years he exercised a wide influence as an editorial writer for the *Cultivator* and the *Country Gentleman*, his articles dealing with a great variety of practical farm topics. He also published a book, *Farm Implements and Machinery* (1869), and a nine-volume work, *Rural Affairs* (1855–81), both of which were valuable in their day and serve as records of their time. His fame rests chiefly upon his work as a pomologist and upon his book, *The American Fruit Culturist*, which appeared first in 1845. As revised by W. H. S. Wood in 1897 it reached its twentieth edition. The twenty-first edition was issued in 1903, and this was reprinted in 1909.

THOMAS, JOSEPH (1811–91). An American lexicographer and physician. He was born in Cayuga Co., N. Y.; educated at the Polytechnic Institute, Troy, and at Yale College, and then studied medicine in Philadelphia. In 1857–58 in India, and afterward in Egypt, he made a special study of Sanskrit, Persian, Arabic, and other Oriental languages. Subsequently he became professor of Latin and Greek at Haverford College, Pa. In association with Thomas Baldwin he published in 1845 *A Pronouncing Gazetteer*, in 1854 *A New and Complete Gazetteer of the United States*, and in 1855 *The Complete Pronouncing Gazetteer of the World*, which has been often revised. In 1870–71 appeared his *Universal Pronouncing Dictionary of Biography and Mythology*, a work of painstaking labor (3d ed., revised, 1905). Thomas also edited *A Comprehensive Medical Dictionary* (1864; revised, 1886).

THOMAS, LORENZO (1804–75). An American soldier, born in Newcastle, Del. He graduated at the United States Military Academy in 1823, and served in the Florida War. In 1838 he was appointed assistant adjutant general, in 1839–40 was chief of staff of the forces in Florida, served in the Mexican War as chief of staff of Gen. W. O. Butler, and was brevetted lieutenant colonel for gallantry at Monterey. From 1861 to 1863 he was adjutant general with rank of brigadier general, and during the remaining two years of the war organized colored troops in the Southern States. President Johnson in 1868 appointed him Secretary of War, dismissing Stanton, but as the latter refused to vacate his post, Thomas did not assume the office. In 1865 he was brevetted major general, and in 1869 was retired.

THOMAS, M(ARTHA) CAREY (1857–). An American educator, born at Baltimore, Md. She graduated at Cornell in 1877, and studied also at Johns Hopkins and at Leipzig and Zurich (Ph.D., 1883). She was the first woman to receive such a doctorate at a European university. In 1885 she became professor of English and dean, and in 1895 president, of Bryn Mawr College. She was elected a trustee of Cornell, and was honored by the degree of LL.D. from the Western University of Pennsylvania and from Brown. She published: *Sir Gawayne and the Green Knight* (1883); *Education of Women* (1900), and articles in the *Educational Review*. In 1915 Miss Mary Garrett, who had been prominent in suffrage work and a benefactor of Bryn Mawr, left to President Thomas $15,000,000 to be disposed of as she saw fit.

THOMAS, SETH (1785–1859). An American manufacturer, born in Wolcott, Conn. After receiving a meagre education, he was apprenticed to a carpenter and joiner in New Haven. Subsequently he settled in Plymouth Hollow (now Thomaston) and with two partners began the manufacture of clocks, finally becoming sole proprietor of an establishment which grew to be one of the largest clock factories in the world.

THOMAS, SIDNEY GILCHRIST (1850–85). A British metallurgist and inventor. Born in London, he received an elementary education at Dulwich College, but by study after hours spent as a clerk was able to gain a knowledge of chemistry, especially in its relations to technology. When opportunity offered he attended lectures at the Royal School of Mines and was able to pass examinations for the degree in metallurgy, but this was denied him, owing to absence from day lectures. From 1870 he worked on the elimination of phosphorus in the Bessemer converter, and in 1875 reached a practical solution of the problem by employing a basic lining of magnesia or magnesian limestone. He secured the coöperation of his cousin Percy Gilchrist, also a chemist, and after obtaining a first patent in November, 1877, announced the invention in the following year. The process (discussed under IRON AND STEEL, *Bessemer Process*) soon came into wide use everywhere, and Thomas received both financial returns and scientific honors, notable among which was the Bessemer medal of the Iron and Steel Institute of Great Britain in 1883. Consult Jeans, *Creators of the Age of Steel* (London, 1884).

THOMAS, THEODORE (1831–1905). An American orchestral conductor, born in Esens, East Friesland. He received his musical education from his father, and played the violin at public concerts when only six years of age. He came with his parents to America in 1845, was a member of the orchestra of the Italian opera in New York, and played first violin in the first American concert tour of Jenny Lind. In 1861 he began the formation of an orchestra that became famous, and in 1864 gave his first symphony concerts in New York. In 1866 he instituted summer-night festivals. For nine years from 1869 he made an annual round of the principal American cities. In 1878 he accepted the position of director of the College of Music at Cincinnati, but in 1880 he returned to New York, where he was conductor of the Philharmonic Society until 1890. The orchestra which he built up in Chicago, where he lived thereafter, came to be recognized as one of the great orchestras of the world. Notwithstanding a heavy annual deficit, the orchestra's guarantors supported Thomas in his determination to present nothing but the best in music. He finally succeeded in winning the public to his own ideals. (See CHICAGO ORCHESTRA.) Consult G. P. Upton, ed., *Theodore Thomas: a Musical Autobiography* (2 vols., Chicago, 1905), and for sidelights, Rose Fay Thomas (his wife), *Our Mountain Garden* (New York, 1904; new ed., 1915).

THOMAS, THEODORE GAILLARD (1832–1903). An American gynæcologist, born in Edisto Island, S. C., and educated in Charleston. He studied in Europe, principally in Paris and Dublin, in 1853–55, and began the practice of his profession in New York. He was a lecturer in New York University (1855–63), and professor in the College of Physicians and Surgeons, New York City (1863–89), where he held the chair of gynæcology when he retired. Thomas was the first to perform and publish an account of vaginal ovariotomy (1870). He wrote *Diseases of Women* (Philadelphia, 1868), which passed through six editions in English, and was translated into French, German, Spanish, Chinese, and Italian.

THOMAS, W. H. GRIFFITH (1861–). A Canadian theologian. He was born in England, graduated at Christ Church, Oxford, and was ordained priest of the Church of England in 1885. After filling several minor appointments he was vicar of St. Paul's, Portman Square, London, in 1896–1905, and principal of Wycliffe Hall, Oxford, in 1905–10. In the latter year he was appointed professor of the Old Testament at Wycliffe College, Toronto. His publications include: *Methods of Bible Study* (1902); *Handbook of the Acts* (1905); *The Catholic Faith* (1906); *Commentary on Genesis* (3 vols., 1907–08); *The Power of Peace* (1908); *Christianity in Christ* (1909); *Life Abiding and Abounding* (1909); *Commentary on Romans* (3 vols., 1911–12); *The Work of the Ministry* (1911); *The Holy Spirit of God* (1913); *The Prayers of St. Paul* (1914).

THOMAS À BECKET, à bĕk'ĕt. See BECKET.

THOMAS À KEM'PIS. See KEMPIS.

THOMAS AQUINAS. See AQUINAS.

THOMAS HUBBARD, CAPE. See HEIBERG LAND.

THOMASIUS, tō-mä'zē-ṳs, CHRISTIAN (1655–1728). A German philosopher and jurist, born in Leipzig. He began to lecture in the University of Leipzig. His lectures were free from pedantry, and were delivered in the German language instead of the traditional Latin. These innovations brought hostility from conservative educators. He edited the first scientific journal in German, but its liberal tone excited so much opposition that he was forced to leave Leipzig. He went to Halle in 1690, where he was one of the founders of the university and its first professor of jurisprudence. His great aim was to harmonize and blend science and life. His important works were: *Institutionum Jurisprudentiæ Divinæ Libri Tres* (1688); *Fundamenta Juris Naturæ et Gentium* (1705); and *Geschichte der Weisheit und Thorheit*. Consult B. A. Wagner, *Christian Thomasius: ein Beitrag zur Würdigung seiner Verdienste um die deutsche Litteratur* (Berlin, 1872); R. Kayser, *Thomasius und der Pietismus* (Hamburg, 1900); A. D. White, *Seven Great Statesmen in the Warfare of Humanity with Unreason* (New York, 1910).

THOMASIUS, GOTTFRIED (1802–75). A German theologian. He was born at Egenhausen, Württemberg, studied at Erlangen, Halle, and Berlin, and was professor of systematic theology at Erlangen from 1842 till his death. His most important publications were: *Origines* (1837); *Christi Person und Werk* (1852–61; 3d ed., 1886–88); *Die christliche Dogmengeschichte* (1874–76; 2d ed., 1886–89). Consult A. von Stählin, *Löhe, Thomasius, Harless* (Leipzig, 1887).

THOMAS (*Lat. pron.* thō'măs) **MAGIS'TER** (Gk. *Θωμᾶς ὁ Μάγιστρος*, *Thōmas ho Magistros*, Master Thomas). A Greek rhetorician and grammarian of the early part of the fourteenth century, born probably at Thessalonica. For some time at the court of the Byzantine Emperor Andronicus Palæologus II, he held important offices. Later, having retired to a monastery, he compiled a Lexicon of Attic Greek (Ἐκλογαὶ Ὀνομάτων Ἀττικῶν). His works also include scholia to Æschylus, Sophocles, Euripides, and three plays of Aristophanes, which are preserved with the other scholia to those authors, as well as lives of these writers which have come down to us in the manuscripts of their works. Letters and orations of Thomas Magister have been preserved. Especially noteworthy is the oration on Gregory of Nazianzus. The earliest edition of the Lexicon is that of Z. Callierges (1517); the latest, that of Ritschl (1832).

THOMAS OF AQUINO. See AQUINAS, THOMAS.

THOMAS OF CELANO, chā-lä'nō (c.1200–c.1255). One of the first members of the Franciscan Order. He was born at Celano, in the Abruzzi, became acquainted with Francis of Assisi, and was in 1221 sent by him upon a mission to Germany. In 1222 he was placed over the monasteries of Worms, Speyer, Mainz, and Cologne, but in 1230 we find him again in Italy. His intimacy with Francis eminently fitted him to be his biographer, and he wrote two sketches of the saint, which are of primary importance (Eng. trans., 1908), as well as the *Life* of St. Clara (Eng. trans., 1910). Of more universal interest is his claim, now practically admitted by all scholars, to be considered the author of the *Dies Iræ* (q.v.), except perhaps the last six verses.

THOMAS OF ERCELDOUNE. See THOMAS THE RHYMER.

THOMAS SLAG, PHOSPHATIC SLAG, BASIC SLAG. A by-product of the manufacture of steel from phosphatic ores by the basic or Thomas (see THOMAS, S. G.) process, in which phosphorus is eliminated from the pig iron by means of basic (rich in lime) lining to the Bessemer converters and by adding lime to the molten pig iron. The slag is therefore rich in lime (about 15 per cent in the free state and 40 per cent combined with other substances). The phosphoric acid content of the product as found in the market is very variable, ranging from 10 to 25 per cent. Slag of average quality contains 15 to 20 per cent of phosphoric acid. In good slag 80 per cent of this phosphoric acid should be available, as shown by the chemical methods of determining availability, viz., treatment with a weak solution of citric acid or ammonium citrate. The phosphoric acid of slag, unlike that of superphosphates, is practically insoluble in water. Attempts have been made with some success to prepare a slag in which the phosphoric acid is more available by fusing the product as obtained from the converters at about 900° C. with sufficient silica (quartz) to convert the free lime into silicate. Such slag differs materially from the untreated product not only in containing a higher percentage of available phosphoric acid and of silica, but in being practically devoid of free lime. Basic slag is not suited to the manufacture of superphosphates and is generally used without any treatment except fine grinding. The value of the material depends very largely upon its fineness.

Slag has been used in large quantities for agricultural purposes in Europe for a number of years. At the time of the outbreak of the Great War in 1914 the world's consumption had reached about 4,500,000 tons annually. It has not been extensively introduced into the United States, although a limited amount is being made there. Experiments have shown slag to be a very valuable phosphatic fertilizer, and on account of its high percentage of lime especially suited to use on acid soils and those rich in organic matter. It would not be wise to use it freely on poor sandy soils deficient in organic matter.

Slag appears to be especially suited to leguminous crops. Six hundred to 1000 pounds per acre is considered a liberal dressing. It should not be mixed with ammonium sulphate before use, since its high percentage of free lime is likely to cause a loss of ammonia by volatilization. Mixtures of the slag with other salts, such as muriate of potash and nitrate of soda, cake badly and are difficult to handle and distribute uniformly. See MANURES AND MANURING.

THOMAS THE RHYMER, or more correctly THOMAS OF ERCELDOUNE, or THOMAS LEARMONT (c.1220–c.1297). A Scottish seer and poet, about whom very little is positively known. Erceldoune (now called Earlston) was a village in Berwickshire on the river Leader, about two miles above its junction with the Tweed. There is mention of Thomas as a seer in the continuation of Fordun's *Scotichronicon*, attributed to Walter Bower (died 1449). For centuries all sorts of prophecies were connected with his name. A collection of them was published at Edinburgh in 1603 under the title *The Whole Prophesie of Scotland*. To Thomas the Rhymer has been attributed a beautiful fairy story in verse. According to the legend, Thomas met a "lady fair" at Huntly Banks and was conveyed to fairyland, where he acquired knowledge that made him famed. After some time there he was permitted to go to the earth to practice his prophetic skill, on condition that he should return at the fairy's bidding. One day, while he was making merry with his friends, the summons came. He disappeared in the forest and never came again to earth. The poem, consisting of the minstrel's usual prologue and three fyttes, contains 700 lines. It exists in four complete manuscripts, the oldest being the *Thornton* at Cambridge (assigned to 1430–40). Though they are all in English, they point to an older original, which may have been the composition of Thomas. Sir Walter Scott and others also ascribed to Thomas the verse romance of *Sir Tristrem*. It exists in a single manuscript in the Advocates' Library at Edinburgh. Though the poem contains allusions to Thomas of Erceldoune, his authorship is now questioned. Consult *The Romance and Prophecies of Thomas of Erceldoune*, edited by J. A. H. Murray for the Early English Text Society (London, 1875); *Thomas of Erceldoune*, edited by Brandl (Berlin, 1880).

THOMASTON. A town in Litchfield Co., Conn., 10 miles by rail north of Waterbury, on the Naugatuck River and on the New York, New Haven, and Hartford Railroad (Map: Connecticut, C 3). There are large clock and watch factories, a brass rolling mill, and manufactories of cutlery and brass products. Pop., 1900, 3300; 1910, 3533.

THOMASVILLE, tŏm'*as*-vĭl. A city and the county seat of Thomas Co., Ga., 200 miles west of Savannah, on the Ochlocknee River and on the Atlantic Coast Line, the Atlanta, Birmingham, and Atlantic, and the Florida Central railroads (Map: Georgia, B 5). It is picturesquely situated on high ground, and has attained considerable prominence as a winter and health resort. There are three large hotels. The South Georgia College and Young's College for Women are here, and the city has also a public library, a normal school for negroes, the Vashti Home for Girls, and Paradise, McIntyre, and Magnolia parks. Thomasville is surrounded by a fertile region producing cotton, sugar cane, tobacco, melons, figs, pears, grapes, and vegetables. Its manufacturing interests are centred mainly in the lumber industry, and there are ironworks. Thomasville was settled in 1850 and received its present charter in 1889. Pop., 1900, 5322; 1910, 6727.

THOMASVILLE. A city in Davidson Co., N. C., 22 miles southwest of Greensboro, on the Southern and the Carolina and Yadkin railroads (Map: North Carolina, B 2). It contains the Thomasville Baptist Orphanage. There are machine shops, a veneer and woodworking plant, cotton mills, and manufactories of chairs, spokes, handles, and furniture. Pop., 1910, 3877.

THOMÉ, tô'mâ', FRANÇOIS (commonly called Francis) (1850–1909). A French composer, born at Port-Louis, Mauritius. From 1866 to 1870 he attended the Paris Conservatory, studying pianoforte with Marmontel and theory with Duprato. He is known chiefly for his piano pieces, which are distinguished by grace and refinement. His ballets and pantomimes enjoyed considerable popularity during the composer's life.

THOMIST, thō'mĭst. A follower of Thomas Aquinas (q.v.) in philosophy or theology. See ALEXANDRISTS.

THOMMEN, tôm'm*e*n, ACHILLES (1832–93). An Austrian engineer, born at Basel, and educated at the university of his native town and in the polytechnic institute of Karlsruhe. He built the railroad over the Brenner Pass in 1861–67. From 1867 to 1869 he was head of the railroad system of Hungary. He wrote *Die Gotthardbahn-Bemerkungen zur Reform* (1877).

THOMPSON, tŏmp'son. A town, including several villages, in Windham Co., Conn., 3 miles northeast of Putnam, on the Quinebaug River, and on the New York, New Haven, and Hartford Railroad (Map: Connecticut, H 2). Farming and the manufacture of cotton goods and woolens are the leading industries of the community. Originally a part of Killingly, Thompson became a parish in 1728, and was incorporated as a town in 1785. Pop., 1900, 6442; 1910, 4804.

THOMPSON, AUGUSTUS CHARLES (1812–

1901). An American Congregational clergyman. He was born at Goshen, Conn., and studied at Yale College, at Hartford Theological Seminary, and the University of Berlin. He became pastor of the Eliot Congregational Church, Roxbury, Mass. (1842). He visited India with Dr. Rufus Anderson (1854–55), and lectured on foreign missions at Andover Theological Seminary (1877–80), at Boston University (1882), and at Hartford Theological Seminary (1885–86). His publications include memorials of Mrs. Anna J. Waters (1854), of H. M. Mill (1856), of Rev. Dr. Rufus Anderson (1880); *Moravian Missions* (1882); *Foreign Missions* (1889); *Protestant Missions* (1894); *Eliot Memorial* (Boston, 1900); and numerous works of a popular character.

THOMPSON, BENJAMIN. See RUMFORD, BENJAMIN THOMPSON, COUNT.

THOMPSON, CHARLES MINER (1864–). An American editor and author. He was born at Montpelier, Vt., and graduated from Harvard in 1886. In 1887–90 he served as literary editor of the Boston *Advertiser*. He was associate editor of the *Youth's Companion* from 1890 to 1911, thereafter editor in chief, and after 1912 part owner. Among his entertaining stories are: *The Nimble Dollar* (1895), a book for boys; *The Calico Cat* (1908); *An Army Mule* (1910).

THOMPSON, DANIEL GREENLEAF (1850–97). An American psychologist and sociologist. He graduated at Amherst College in 1869 and was admitted to the bar in New York in 1872. However, he devoted his time mainly to the psychology of religion and sociological subjects, and is chiefly known for his *System of Psychology* (2 vols., 1884); *The Religious Sentiments of the Human Mind* (1888); *Social Progress* (1889); *The Philosophy of Fiction in Literature* (1890); *Politics in a Democracy* (1893). In his books Thompson takes a position violently antagonistic to various dogmas.

THOMPSON, DANIEL PIERCE (1795–1868). An American lawyer, politician, and novelist, born at Charlestown, Mass. He graduated at Middlebury College (1820), went to Virginia as tutor, studied law there, and was admitted to the bar (1823). He settled in Montpelier, Vt., in 1824, held various legal offices in that State, compiled, by legislative appointment, *Laws of Vermont from 1824 down to and including the Year 1834* (1835), was Secretary of State of Vermont (1853–55), and editor of a political weekly, *The Green Mountain Freeman* (1849–56). His first novel was a satire on the Anti-Masonic agitation, *The Adventures of Timothy Peacock* (1835). In the same year was published his *May Martin, or the Money Diggers.* Much popularity was achieved by *The Green Mountain Boys* (1840) and *The Rangers* (1857), romances of Revolutionary Vermont. He also wrote a *History of Montpelier, 1781–1860* (1860).

THOMPSON, DAVID (1770–1857). A Canadian explorer, born in Westminster, London. He was educated at Oxford and in 1789 came to America in the service of the Hudson's Bay Company. He became engaged in explorations near the Great Lakes, in 1798 discovered Turtle Lake, one of the sources of the Mississippi, and in 1807–11 crossed the Rocky Mountains and explored the course of the Columbia River. In 1797 he became connected with the Northwest Company. He was with the Canadian-United States boundary survey (1816–26), later having charge of surveying and exploring expeditions in the Canadian Northwest. He published *A Map of the Northwest Territory of the Province of Canada* (1814).

THOMPSON, DENMAN (1833–1911). An American actor, best known for his impersonation of the rustic "Josh" Whitcomb. He was born in Erie Co., Pa., but passed his boyhood in Swanzey, N. H., where he found some types that he later made famous. His stage début was at Lowell, Mass., in 1852. *Joshua Whitcomb* was first brought out in 1875. In 1886 Mr. Thompson produced *The Old Homestead*, in which the same leading character appears, and this play, with its depiction of country life, became the material of his subsequent popularity. It ran for four successive seasons in New York (1888–91), and toured the United States for years. Consult McKay and Wingate, *Famous American Actors of To-Day* (New York, 1896).

THOMPSON, SIR EDWARD MAUNDE (1840–). An English antiquary, born in Jamaica, West Indies. After studying at Rugby and at University College, Oxford, he was called to the bar at the Middle Temple in 1867. In 1861 he was appointed assistant in the British Museum; in 1878 he became keeper of the manuscripts and Egerton librarian; and was principal librarian (1888–1909). He was Sandars reader in bibliography at Cambridge (1895–96; 1905–06), and was knighted in 1895, receiving the G.C.B. in 1909. Editions by him include: *Chronicon Angliæ, 1328–88*, in the "Rolls Series" (1874); and, for various societies: *Letters of Humphrey Prideaux* (1875); *Chronicon Adæ de Usk, 1377–1404* (1876); *Correspondence of the Family of Hatton* (1878); *Diary of Richard Cocks in Japan, 1615–22* (1883); the facsimile of the "Laurentian Sophocles" (1885), with Professor Jebb. Thompson's *Handbook of Greek and Latin Palæography* (1893) appeared in an enlarged edition as *Introduction to Greek and Latin Palæography* (1912).

THOMPSON, ERNEST SETON. See SETON, ERNEST THOMPSON.

THOMPSON, FRANCIS (1860–1907). An English poet, the son of a Lancashire physician. He was educated at the Ushaw Roman Catholic College, near Durham, and then studied medicine at Owens College, Manchester. Giving up medicine, he went to London, where, after a sharp struggle with poverty, he was "discovered" and rescued by Wilfrid and Alice Meynell (qq.v.), and then suddenly found himself famous. His *Poems* (1893) ran through several editions, receiving high praise from the reviewers and from Browning. This volume was followed by *Sister Songs* (1895) and *New Poems* (1897). Thompson's early experience broke down his health, and he died of tuberculosis. Essentially a mystic, he takes high rank among the poets of his time. In prose, he wrote literary criticism for the *Academy* and the *Athenæum; Health and Holiness* (1905), and the following books posthumously published: *Life of St. Ignatius Loyola* (1909); the admirable essay, *Shelley* (2d ed., 1909); *A Renegade Poet, and Other Essays* (1910); *Life of John Baptist de la Galle* (1911). A three-volume edition of his *Works* appeared in New York in 1913. Consult: P. E. More, *Shelburne Essays* (7th series, New York, 1910); G. A. Beacock, *Francis Thompson* (Marburg, 1912); K. Rooker, *Francis Thompson* (in French, London, 1913); Everard Meynell, *Life of Francis Thompson* (New York, 1913).

THOMPSON, George (1804–78). An English abolitionist. He was born in Liverpool, England, and first became known in 1833 by his lectures in connection with the antislavery agitation throughout the British colonies. He was largely instrumental in procuring the freedom of the slaves and the abolition of the apprenticeship system. He was a member of the Anti-Corn Law League, and also took an active part in forming the British India Association, which procured better government for the people of India. He was associated with Garrison, Whittier, and others in the antislavery movement in the United States, and a visit which he paid to that country in 1834 led to the formation of upward of 150 antislavery societies. He belonged to the National Parliamentary Reform Association of England, and from 1847 to 1852 was a member of Parliament for the Tower Hamlets District, London.

THOMPSON, Sir Henry (1820–1904). An English surgeon, born in Framlingham, Suffolk. He was educated at University College, London, and was appointed assistant surgeon of the University College Hospital, London, in 1856; surgeon in 1863; professor of clinical surgery in 1866; and consulting surgeon in 1874. In 1884 he was professor of surgery and pathology in the Royal College of Surgeons, London. He was especially known through his operation upon the bladder. In 1864 he became surgeon extraordinary to Leopold I of Belgium (by whom, owing to the success of an operation, he was knighted in 1867), and in 1868 to his successor, Leopold II. He also operated upon Napoleon III (1872) shortly before the ex-Emperor's death. He studied painting, and frequently exhibited pictures at the Royal Academy (London), the Salon (Paris), and elsewhere. He first brought before the English public the desirability of cremation and in 1874 founded the Cremation Society of London. Several of his books were translated into German and French. The best known include: *Practical Lithotomy and Lithotrity* (1863); *Clinical Lectures on Diseases of the Urinary Organs* (1868); *Modern Cremation* (1890); *On Food and Feeding* (1901); and the novels *Charley Kingston's Aunt* and *All But*, which appeared under the pseudonym of "Pen Oliver."

THOMPSON, Jacob (1810–85). An American politician, born in Caswell Co., N. C. He graduated at the University of North Carolina and in 1834 he was admitted to the bar, and in the next year removed to the Chickasaw country in Mississippi. From 1839 to 1851 he was a member of the United States House of Representatives, served as chairman of the Committee on Indian Affairs, and advocated nonacceptance of the Compromise of 1850. In 1857 he became Secretary of the Interior, and greatly systematized the work of the department, though the defalcation of a trusted clerk clouded his administration. In January, 1861, he resigned and was appointed aid to General Beauregard, and served with him through the Shiloh campaign. From 1862 to 1864 Thompson was Governor of Mississippi. In the latter year he was sent as Confederate Commissioner to Canada, and to organize the Confederate sympathizers in Ohio, Indiana, and Illinois. Unsuccessful attempts were made to capture the gunboat *Michigan*, and to organize the escaped Confederate prisoners, and to take Camp Douglas, free the prisoners there confined, and take Chicago. After the assassination of Lincoln, Thompson was charged with complicity, and a price was put upon his head. He escaped to Europe, however, and remained there some time. When he returned he was not brought to trial, though a civil suit was brought in 1876 for the money taken by the dishonest clerk while Thompson was Secretary of the Interior.

THOMPSON, John Reuben (1823–73). An American journalist and poet, born in Richmond, Va. He graduated at the University of Virginia (1844), practiced law in Richmond, became in 1847 editor of the *Southern Literary Messenger*, which for 12 years he made influential. In it appeared early writings of D. G. Mitchell, John E. Cooke, Philip P. Cooke, Paul Hayne, and Henry Timrod. In 1859 he moved to Augusta, Ga., to edit *The Southern Field and Fireside*. The Civil War drove him in 1863 to London, where he wrote for English magazines defending the Confederacy. After the war he returned to America and was literary editor of the New York *Evening Post* till 1872. His poems enjoyed local popularity.

THOMPSON, Sir John Sparrow David (1844–94). A Canadian statesman, born at Halifax, Nova Scotia. He received a common-school education and was admitted to the bar in 1865. Here his ability and industry soon placed him in the first rank. He took an active interest in politics and in 1877 was elected to the Nova Scotia Assembly. The next year he was appointed Attorney-General and in 1881 he became Premier. In 1882 he was appointed a justice of the Supreme Court of Nova Scotia, but in 1885 he gave up this position to accept the portfolio of Minister of Justice in the Dominion government, and in 1886 he brilliantly defended the conduct of the administration in regard to Louis Riel (q.v.). The next year he was chosen legal adviser to the British plenipotentiaries who negotiated the fisheries treaty of 1887 with the United States, and as a reward for his services was knighted (K.C.M.G.). In 1892 he became Prime Minister of Canada and in 1893 one of the arbitrators on the Bering Sea Controversy (q.v.). He died while in Windsor Castle, where he had just taken the oath as a member of the Queen's Privy Council.

THOMPSON, Joseph Parrish (1819–79). An American clergyman and scholar, born in Philadelphia. He graduated at Yale in 1838, was ordained a Congregational minister in 1840, was pastor in New Haven (1840–45) and New York (1845–71), lecturer on Egyptology at Andover (1871), and engaged in Oriental studies, chiefly in Berlin, from 1872 till his death. Thompson aided in establishing the New York *Independent*. Among his publications the more noteworthy are: *Egypt, Past and Present* (1856); *Man in Genesis and Geology* (1869); *Church and State in the United States* (1874); *The United States as a Nation* (1877); *The Workman, his False Friends and his True Friends* (1879). His political and social essays are gathered in *American Comments on European Questions* (1884).

THOMPSON, Launt (1833–94). An American sculptor, born in Abbeyleix, Queen's County, Ireland. He came to America in 1847, settling at Albany, where he was a pupil and assistant of Erastus Palmer, with whom he remained nine years. In 1858 he opened a studio in New York City, where he first attracted attention by his medallion heads and later by some successful portrait busts and statues. He was elected a member of the National Academy in 1862. In 1868 he passed a year at Rome, and in 1875–87 again visited Italy, residing principally at Florence. His best-known medallions are "Morning Glory" and a portrait of Gen. John A. Dix. Among his statues, which are characterized by good workmanship and dignified presentation, are: Napoleon (1867, Metropolitan Museum, New York); President Abraham Pierson (1874, Yale University); Gen. Ambrose Burnside, an equestrian statue at Providence, R. I.; Gen. Winfield Scott and Admiral Dupont, equestrian statues in Washington. Good examples of his numerous busts are those of Edwin Booth as Hamlet, Samuel F. B. Morse, and William Cullen Bryant (Metropolitan Museum, New York).

THOMPSON, (James) Maurice (1844–1901). An American novelist, poet, and journalist, born in Fairfield, Ind. His boyhood was spent chiefly in Kentucky and Georgia. He served in the Confederate army, and after the war returned to Indiana, and practiced law and civil engineering at Crawfordsville. From 1885 to 1889 he was State geologist. In 1890 he went to New York and joined the editorial staff of the *Independent*, having already made a name for himself in literature by *Hoosier Mosaics* (1875), *The Witchery of Archery* (1878), *A Tallahassee Girl* (1882), *His Second Campaign* (1882), *Songs of Fair Weather* (1883), *At Love's Extremes* (1885), *By-Ways and Bird Notes* (1885), *The Boy's Book of Sport* (1886), *A Banker of Bankersville* (1886), *Sylvan Secrets* (1887), *The Story of Louisiana* (1888), and *A Fortnight of Folly* (1888). His later writings include: *Poems* (1892); *The Ethics of Literary Art* (1893); *The Ocala Boy* (1895); *My Winter Garden* (1900), good impressionist descriptions of subtropical Louisiana; *Alice of Old Vincennes* (1900), a very popular novel and his best. Posthumously printed were two immature novels, *Sweetheart Manette* and *Milly* (1901).

THOMPSON, Mortimer (1832–75). An American journalist and humorist, born at Riga, Monroe Co., N. Y. He studied at the University of Michigan, contributed humorous articles to the *Advertiser* of Detroit, and afterward was a writer for the New York *Tribune*, in which were published his series of letters from Niagara Falls and his account of the Pierce-Butler slave auction at Savannah, printed by the Antislavery Society as a tract. For several years he was a popular lecturer. He published under the pseudonym "Q. K. Philander Doesticks, P.B."—interpreted by him as "Queer Kritter, Philander Doesticks, Perfect Brick"—a number of volumes, including *Doesticks—What he Says* (1855); a parody of *Hiawatha, Plu-ri-bus-tah: A Song that's by No Author* (1856); and *Nothing to Say, Being a Satire on Snobbery* (1857).

THOMPSON, Richard Wigginton (1809–1900). An American political leader, born in Culpeper Co., Va. In 1831 he removed to Louisville, Ky., but soon afterward went to Lawrence Co., Ind., where in 1834 he was admitted to the bar. In 1840 he was elected to Congress, and in 1847 was again elected. He was appointed judge of the Fifth Indiana Circuit in 1867, and in 1877 was Secretary of the Navy in the cabinet of President Hayes. His publications include: *The Papacy and the Civil Power* (1876); *History of Protective Tariff Laws* (1888); *Personal Recollections of Sixteen Presidents* (1894); *Footprints of the Jesuits* (1894).

THOMPSON, Robert Ellis (1844–). An American educator, born near Lurgan, Ireland. At an early age he emigrated to the United States, and in 1865 graduated at the University of Pennsylvania. From 1868 until 1892 he was a professor in the University of Pennsylvania, and in 1894 became principal of the Philadelphia Central High School. He was editorially connected with several periodicals, and published: *A History of the Presbyterian Churches of America* (1895); *The Hand of God in American History* (1902); *Harvard University Lectures on Protection to Home Industries* (1908); *The Historic Episcopate* (1910); *The History of the Dwelling House and its Future* (1914).

THOMPSON, Silvanus Phillips (1851–1916). An English physicist. He was born at York, and was educated at the Royal School of Mines and the University of London (B.A., 1869; B.Sc., 1876; D.Sc., 1878). He was lecturer and professor of experimental physics in the University College, Bristol, from 1876 to 1885, when he became principal and professor of physics in the City and Guilds Technical College, Finsbury. Professor Thompson did much to spread knowledge of electricity, while also carrying on original researches. His publications include: a popular textbook, *Elementary Lessons in Electricity and Magnetism* (1881; 7th ed., rev., 1915); *Dynamo-Electric Machinery* (1886; 7th ed., 1904); *Light, Visible and Invisible* (1897; 2d ed., 1910); *Polyphase Electric Currents and Alternate-Current Motors* (1895); *Michael Faraday: His Life and Work* (1898); *The Life of Lord Kelvin* (1910).

THOMPSON, Smith (1768–1843). An American jurist and cabinet officer. He was born in Stanford, Dutchess Co., N. Y., graduated at Princeton College in 1788, and was admitted to the bar in 1792, having studied under Chancellor Kent. After serving as a member of the New York Legislature (1800) and of the State Constitutional Convention (1801), he became associate justice of the State Supreme Court (1802–14), and Chief Justice (1814–18). In 1818 he became Secretary of the Navy in Monroe's cabinet, and in 1823 was appointed to the United States Supreme Court, of which he remained an associate justice until his death.

THOMPSON, Thomas Perronet (1783–1869). An English general and political reformer. He was born in Hull and was educated at Queens' College, Cambridge. He took part in the Buenos Aires campaign, 1807, and in 1808 was made Governor of Sierra Leone. His recall to England in 1810 was due to the influence of the slave traders, against whose traffic he had taken active measures. He was with the British army in the Peninsular and French campaigns of 1813 and 1814, and in the Indian Pindari campaign of 1818. In 1820, with a small force, he was defeated at Sur, on the Arabian coast, by a band of Arabs, whom he was attempting to punish for piracy. He returned to England and in 1824 became one of the founders, and later proprietor, of the *Westminster Review*, to which he was a versatile and prolific contributor. Among his well-known publications are *Catechism on the Corn Laws* (1827), *Catechism on the Currency* (1848), *Fallacies against the Ballot* (1855). His miscellaneous writings were published as *Exercises, Political and Other* (6 vols., 1842). He was elected to Parliament (1835, 1847, and 1857). He became general in 1868.

THOMPSON, Waddy (1798–1868). An American legislator and diplomat, born in Pickensville, S. C. He graduated at the South Carolina College in 1814 and in 1819 was admitted to the bar. From 1835 to 1841 he was a member of the National House of Representatives as a Whig, and in 1840 was chairman of the Committee on Military Affairs. In 1842–44 he was Minister to Mexico, and secured the release of 200 Texan prisoners. He published *Recollections of Mexico* (1846).

THOMPSON, William (1725–81). An American soldier. He was born in Ireland, emigrated to Pennsylvania, served (1759–60) as captain of militia in the French and Indian War, and in June, 1775, was placed in command of eight Pennsylvania companies, with the rank of colonel. In January, 1776, he took the same rank in the regular Continental army, and on March 1 became brigadier general. On March 19 he relieved Gen. Charles Lee at New York, and in April led 14 regiments to Canada to reenforce Gen. John Thomas, assuming chief command during Thomas's illness and holding it until the arrival (June 4) of General Sullivan. He led the Americans in the unsuccessful attack on the English at Three Rivers (June 6), and was taken prisoner. Though immediately paroled, he was not exchanged until Oct. 25, 1780.

THOMPSON, William Howard (1871–). An American legislator. He was born at Crawfordsville, Ind., and moved to Kansas with his parents in 1880. After graduating from the Seneca (Kans.) Normal School in 1886 he studied law under his father, and was admitted to the Kansas bar in 1894. A Democrat in politics, he served as clerk of the Kansas Court of Appeals from 1897 to 1901, was judge of the thirty-second judicial district of Kansas in 1906–13, and was elected United States Senator for the term 1913–19.

THOMPSON, William Tappan (1812–82). An American journalist and humorist, born at Ravenna, Ohio. He removed to Philadelphia, subsequently to Florida, and thence, in 1835, to Augusta, Ga., where he was attached to the staff of several literary weekly papers. To the *Miscellany,* of Madison, Ga., he contributed the "Major Jones Letters," upon which his fame as a humorist rests. They were published in book form as *Major Jones's Courtship* (1840). In 1850 he established at Savannah the *Morning News,* which he continued to edit during the remainder of his life. In the Civil War he served in the Confederate army as a private and on the staff of Gen. J. E. Brown. He published *Major Jones's Chronicles of Pineville* (1843) and *Major Jones's Sketches of Travel* (1848). A posthumous collection, entitled *John's Alive, or the Bride of a Ghost, and other Sketches,* was published by his daughter, Mrs. M. A. Wade, in 1883.

THOMPSON, Wordsworth (1840–96). An American genre and historical painter. He was born in Baltimore, Md., and studied under Gleyre and Pasini in Paris. In 1868 he opened a studio in New York City, being elected a member of the National Academy in 1875, and of the Society of American Artists two years later. He is best known as a painter of American historical subjects, executed with a smooth but skillful technique. Among his paintings are the "Review at Annapolis, Maryland, 1776" (Buffalo Academy); "Passing the Outpost" (Union League Club, New York); a "New England Homestead," awarded a gold medal at the Paris exhibition, 1889; and his last and best work, "Old Bruton Church, Virginia, in the time of Lord Dunmore" (Metropolitan Museum).

THOMPSON RIVER INDIANS. An important Salishan-speaking tribe of Indians formerly residing on the river of the same name in British Columbia. Their proper name is Ntlakyapamuk, and their culture is typically interior Salishan (q.v.). Consult: James Teit, "Traditions of the Thompson River Indians," in American Folk-Lore Society, *Memoirs,* vol. vi (Boston, 1898); id., "Thompson River Indians of British Columbia," and "Mythology of the Thompson River Indians," in Jesup North Pacific Expedition, *Publications,* vol. i, part iv and vol. viii, part ii, published by the American Museum of Natural History (New York, 1900, and Leyden, 1912).

THOMPSON SETON, Ernest. See Seton, E. T.

THOMS, tŏmz, William John (1803–85). An English antiquary, born in London. For several years, up to 1845, he was a clerk at Chelsea Hospital, and then was appointed clerk of the House of Lords; and from 1863 to 1882 he was its deputy librarian. In recognition of his scholarship he was elected a fellow of the Society of Antiquaries (1838) and secretary of the Camden Society (1838–73). Thoms is most widely known as the founder (1849) of *Notes and Queries.* Thoms published a large number of books of great value to the student and to the curious. Among them are *Early Prose Romance* (1827–28; revised by another hand, 1858); *Lays and Legends of Various Nations* (1834); *Anecdotes and Traditions Illustrative of Early English History and Literature* (Camden Society, 1839); *Hannah Lightfoot* (1867); the *Death of Charles I* (1872); and *Human Longevity* (1873). Consult Thoms's reminiscences under the title "Gossip of an Old Bookworm," in *Nineteenth Century* (London, July and December, 1881).

THOMSEN, tŏm′sĕn, Julius (1826–1909). A Danish chemist, born in Copenhagen. He was educated in the Copenhagen Polytechnic School, where he was professor of chemistry (1847–56), and of which he was director (1883–92). For 30 years (1856–86) he held a chair in the Military High School, and for 25 years (1866–91) occupied one in the University of Copenhagen. Thomsen was the inventor of a process for the manufacture of soda from cryolite, brought from Greenland, but he became best known by his researches on thermochemistry, the results of which are given in his *Thermochemiske Undersogelser* (1869–73; Ger. trans., 1882–86; Eng. trans., 1908).

THOMSEN, Vilhelm Ludvig Peter (1842–). A Danish philologist, born in Copenhagen, where he became professor of comparative philology at the university in 1887. He traveled extensively in Europe and Asia. Among his works are *Den gotiske Sprogklasses Indflydelse paa den finske* (1869); *The Relations Between Ancient Russia and Scandinavia and the Origin of the Russian State* (1877; Ger. trans., 1879), originally lectures delivered at Oxford University; the important *Déchiffrement des inscriptions de l'Orkhon* (1894) and *Inscriptions de l'Orkhon, déchiffrées par V. L. P. Thomsen* (1896), wherein he claims that certain ancient inscriptions found in Mongolia represent the oldest forms known of the Turkish language. Other works deal with Lycian, Etruscan, and Runic inscriptions. Thomsen was one of the foremost philologists of his time.

THOMSON, tŏm′son, ALEXANDER (1817–75). A Scottish architect, born at Balfron. At the age of 17 he entered an architect's office in Glasgow and became deeply interested in Greek architecture. When some years later he began to practice architecture independently, he showed much originality and cleverness in adapting Greek motives to the modern requirements of churches and public buildings; but modern criticism denies the validity of the theory on which his designs were based, and regards his buildings in Glasgow (churches, Egyptian hall, etc.) and Edinburgh as curiosities rather than as masterpieces. He is often referred to as "Greek Thomson."

THOMSON, tôn′sôn′, CÉSAR (1857–). A Belgian violinist, born at Liége. He made successful tours through Spain and Italy and became a member of Bilse's orchestra at Berlin. He gave instruction on the violin at the Liége Conservatory from 1883 to 1897. In 1894 and 1895 he made trips to the United States, and four years later he became Ysaye's successor as professor of violin playing at the Brussels Conservatory. He is noted for his double-stop technique and for his clean-cut bowing.

THOMSON, CHARLES. See RITCHIE, BARON.

THOMSON, tŏm′son, CHARLES (1729–1824). An American patriot. He was born in County Derry, Ireland, and in 1740 was brought to New Castle, Del. He was educated at New London, Pa., and when very young assumed charge of the Friends' Academy at New Castle. He took an active interest in all the controversies between the colonies and the British ministry, and, removing to Philadelphia in 1774, was chosen secretary of the Continental Congress, in which capacity he served until 1789, keeping a careful record of all the proceedings and making copious notes of the debates. John Adams (in his diary for Sept. 30, 1774) speaks of him as "the Sam Adams of Philadelphia, the life of the cause of liberty." In 1789 he was delegated to announce to Washington, at Mount Vernon, his election to the presidency. He published *An Enquiry into the Causes of the Alienation of the Delaware and Shawanese Indians* (1759); an able translation of the Bible, containing the first English version of the Septuagint (4 vols., 1808); and a *Synopsis of the Four Evangelists* (1815). He also prepared a history of the Revolution, which, however, he destroyed in manuscript. Consult L. R. Harley, *The Life of Charles Thomson* (Philadelphia, 1900).

THOMSON, CHARLES EDWARD POULETT, first BARON SYDENHAM. See SYDENHAM.

THOMSON, SIR CHARLES WYVILLE (1830–82). A British naturalist, born in Scotland as Wyville Thomas Charles, which name was changed when he was knighted. He was educated in medicine, but turned his attention to botany, and afterward to a broader consideration of natural history, and became in 1853 professor of natural history in Queen's College, Cork. In 1860 he became professor of natural science at Belfast, and in 1870 at the University of Edinburgh. He became interested in problems relating to deep-sea life, and in 1868, with Dr. W. B. Carpenter, made investigations north of Scotland in the gunboat *Lightning*. Other ocean voyages for scientific sounding and dredging were conducted subsequently, and their results were popularly explained in *The Depths of the Sea* (1873), a volume which attracted much attention. The interest thus aroused was influential in causing the British government to undertake the renowned *Challenger* (q.v.) exploring expedition, the scientific conduct of which was given to Professor Thomson. Its successful and brilliant outcome was recognized at its close (1876) by the conferring of knighthood upon Thomson and by scientific honors from many countries. Sir Wyville resumed his lectures at the university, and began to superintend the disposal of scientific material from the expedition, placing it in the hands of specialists for exhaustive study. He prepared a general narrative, *The Voyage of the Challenger* (2 vols., 1877), but became ill in 1879 and died in 1882. Besides these books, he was the author of over forty papers of importance published in scientific periodicals, relating largely to marine zoology and especially to echinoderms, recent and fossil. He devised many methods and invented much apparatus used in deep-sea exploration (q.v.).

THOMSON, EDWARD (1810–70). An American Methodist Episcopal bishop. He was born at Portsea, England, came to America in 1818, and settled in Wooster, Ohio. He graduated in medicine from the University of Pennsylvania in 1829. After joining the Ohio conference in 1833 he was pastor at Norwalk and Sandusky. In 1836 he was stationed at Detroit. Later he was successively principal of Norwalk Seminary, editor of the *Ladies' Repository*, president of Ohio Wesleyan University (1846–60), and editor of the *Christian Advocate and Journal*, New York. Soon after he was elected Bishop in 1864 he made a world-wide survey of Methodist missions. He published: *Moral and Religious Essays* (1856); *Educational Essays* (1856); *Sketches, Biographical and Incidental* (1856); *Letters from Europe* (1856); *Our Oriental Missions* (1870); *Evidences of Revealed Religion* (1872).

THOMSON, EDWARD WILLIAM (1849–). A Canadian journalist, story writer, and poet. He was born in Peel County, Ontario. He served in the American Civil War in 1864–65, and for some years was a civil engineer on the Carillon Canal. Entering journalism, he was chief editorial writer on the Toronto *Globe* in 1879–91; went to Boston, where he was editor of the *Youth's Companion* (1891–1901); returned to Canada, became Ottawa correspondent of the Boston *Transcript*, and contributed to many periodicals. He published: *Old Man Savarin and Other Stories* (1895); *Walter Gibbs, the Young Boss, and Other Stories* (1896); *Between Earth and Sky* (1897); *Aucassin and Nicolette*, a versification of M. S. Henry's translation (1898); *Peter Ottawa* (1908); *When Lincoln Died and Other Poems* (1909); *The Many-Mansioned House and Other Poems* (1909).

THOMSON, ELIHU (1853–). An American electrical engineer. He was born in Manchester, England, and came to the United States in 1858. He was educated in the Philadelphia Central High School (A.B., 1870), where he was professor of chemistry and mechanics until 1880. Meanwhile he devoted much attention to the study of electricity, and lectured at Franklin Institute. In 1880 he became electrician to the Thomson-Houston Electric Company, which was organized by him, and subsequently he became associated also with the General Electric Company. He devoted himself to inventions relating to arc lighting, incandescent lighting, motor work inducting systems, and especially electric welding. In recognition of his extensive contributions to applied science numerous honors were bestowed upon him: he was elected a member of the National Academy of Sciences and president of the American Institute of Electrical Engineers (1889), and was appointed Officer of the French Legion of Honor, received the Rumford medal of the American Academy of Arts and Sciences, grand prizes at Paris in 1889 and 1900 and at St. Louis in 1904, the Edison medal of the American Institute of Electrical Engineers, and others.

THOMSON, George (1757–1851). A Scottish composer, born at Limekilns, Fife. He was a constant and untiring collector of Scotch, Welsh, and Irish melodies, and had the most celebrated musicians of that period, among them Haydn and Beethoven, engaged in writing accompaniments for them. Each song contained a prelude, code, and ad libitum parts throughout for violin, flute, or cello. Among his works are: *A Select Collection of Original Scottish Airs; A Collection of Songs of Robert Burns, Sir Walter Scott, etc.* (1822); *Select Collection of Original Welsh Airs* (1809); and a *Select Collection of Original Irish Airs* (1814 to 1816); besides 20 Scottish melodies (1839). He died at Leith. Consult I. C. Hadden, *George Thomson* (London, 1898).

THOMSON, James (1700–48). A Scottish poet, born at Ednam, in Roxburghshire, where his father was minister. After attending school at Jedburgh Abbey by the Tweed, he was sent to the University of Edinburgh (1715) with a view to the Church. Forsaking all thought of the ministry, he went to London to seek fame and fortune in poetry (1725). Though poor, he was well received by the Duke of Montrose and others, who helped him bring out *Winter* (1726). This was followed by *Summer* (1727) and *Spring* (1728). In 1730 appeared *Autumn*, bound with the previous poems under the title of *The Seasons*. These poems, issued separately and collectively, were from the first successful, and were exceedingly popular for a century. They marked the return of blank verse and a feeling for nature, of which there had been few traces since Milton. With *The Seasons* the literary historian dates the beginning of the romantic movement in English literature. Appointed in 1730 tutor to the son of Sir Charles Talbot, afterward Lord Chancellor, Thomson traveled for three years in France and Italy. On his pupil's death (1733) he returned to London and was appointed by the Lord Chancellor secretary of briefs, a sinecure, at a salary of £300 a year. He was now able to settle in a pretty cottage at Richmond. The death of his patron in 1737 ended his sinecure; but through Lyttelton he obtained from the Prince of Wales a pension of £100 (1738). He now revised *The Seasons*, enlarging greatly each poem. The new edition was published in 1744. In 1740 appeared *The Masque of Alfred*, written by Thomson and David Mallet and containing Thomson's famous ode, "Rule Britannia," the national patriotic hymn of England. At Richmond, too, was written Thomson's finest poem, *The Castle of Indolence* (1748). For it he employed the Spenserian stanza. The poem is exquisitely colored and reveals here and there rare gleams of imagination. Besides these significant and beautiful poems, Thomson was the author of several tragedies, of which *Sophonisba*, produced at Drury Lane (Feb. 28, 1730), was the first, and *Tancred and Sigismunda*, produced at Drury Lane by Garrick (March 18, 1745), the most successful. His cenotaph was erected in Westminster Abbey by the side of Shakespeare's.

Translations and imitations of *The Seasons* were numerous in France and Germany. Thomson was thus a forerunner of the romantic revival, not only for England, but for the Continent.

Bibliography. The first collected edition of his *Works* was edited by George, Lord Lyttelton (4 vols., London, 1750); the best modern edition of his *Works* is the Aldine, edited with a biography by D. C. Tovey (ib., 1897). Consult also: Léon Morel, *James Thomson, sa vie et ses œuvres* (Paris, 1895); Lefèvre Deumier, in *Célébrités anglaises* (ib., 1895); Joseph Texte, *Cosmopolitisme littéraire au XVIIIème siècle* (ib., 1895; Eng. trans. by J. W. Matthews, New York, 1899); W. Bayne, *Life of James Thomson*, in the "Famous Scots Series" (Edinburgh, 1898); Samuel Johnson, "Thomson," in *Lives of the British Poets*, vol. iii, edited by G. B. Hill (Oxford, 1905); and G. C. Macaulay, *James Thomson* (New York, 1908). See Romanticism.

THOMSON, James (1822–92). A British physicist and engineer, the elder brother of William Thomson, Lord Kelvin (q.v.). He was born at Belfast and was educated at the University of Edinburgh. He settled as a civil engineer in Belfast, where in 1857 he was appointed professor of civil engineering in Queen's College. In 1873 he was elected professor in Glasgow University, succeeding W. J. M. Rankine (q.v.). He made many improvements in hydraulic machinery and predicted from theory the effect of pressure in lowering the freezing point of water. (See Regelation.) His collected papers in physics and engineering, together with unpublished material, were edited by Sir Joseph Larmor and James Thomson, with a biographical sketch by J. T. Bottomley (Cambridge, Eng., 1912).

THOMSON, James (1834–82). An English poet, born at Port Glasgow, Scotland. In 1840 his father was disabled by a paralytic stroke and two years later his mother died. He was educated at the Royal Caledonian Asylum (1842–1850) and then entered (1850) the Military Asylum, Chelsea, to qualify as an army schoolmaster. The next year he was sent as a teacher to Ballincollig, near Cork, where he fell in love with a beautiful girl, who died in 1853. After serving as schoolmaster at various other places, he was discharged from the service in 1862 for a trivial offense against discipline. Through the influence of his friend Charles Bradlaugh, he obtained a clerkship in London; and under the pen name of Bysshe Vanolis, or shortened to B. V. (Bysshe, the middle name of Shelley and Vanolis, an anagram of Novalis), he began writing for the radical magazines, and proved himself a vigorous and active champion of free thought. Except for a few months in the United States and as correspondent for the New York *World* in Spain (1873), he passed the last 16 years of his life in a one-room London lodging. He died an inebriate in University College Hospital. Thomson was a thorough-going pessimist wholly out of joint with the ways of men. He first attracted attention as a poet with his "City of Dreadful Night" (in the *National Reformer*, 1874, reprinted with other poems in 1880), a lurid poem of great imaginative power. Hardly less impressive is the volume entitled *Vane's Story, Weddah and Om-el-Bonain, and Other Poems* (1881). The same year he collected some of his prose writings under the title *Essays and Phantasies*. After his death appeared *A Voice from the Nile, and Other Poems* (1884); *Satires and Profanities* (1884); and *Poems, Essays, and Fragments* (1892). Consult *Poetical Works*, edited with memoir by Bertram Dobell (London, 1895); also H. S. Salt, *Life of James Thomson* (ib., 1889); Bertram Dobell, in *Biographical and Critical Studies* (ib., 1896); P. E. More, *Shelburne Essays*, 5th series (New York, 1908).

THOMSON, John (1778–1840). A Scottish landscape painter. He was born at Dailly, Ayrshire, and studied for a short time under Alexander Nasmyth. Destined for the church, and for 35 years minister at Duddingston, near Edinburgh, Thomson lacked systematic artistic training, but nevertheless he was the greatest Scottish landscape painter of his time and the first to render the true character of Scottish scenery. Among his finest paintings are "Aberlady Bay" and three other landscapes in the National Gallery, Edinburgh: "Fast Castle," "Castle Baan," and the "Graves of the Martyrs." He was an intimate friend of Sir Walter Scott.

THOMSON, John Arthur (1861–). A British zoölogist, born in East Lothian, and educated at the universities of Edinburgh, Jena, and Berlin. He was for a time lecturer on zoology and biology at Edinburgh University and was University Gifford lecturer at St. Andrews in 1915. Among his writings are: *Evolution of Sex* (1899; 3d ed., 1901), with Patrick Geddes; *The Study of Animal Life* (3d ed., 1896); *Outlines of Zoölogy* (6th ed., 1914); *The Science of Life* (1904); *Progress of Science in the Nineteenth Century* (1904); *Herbert Spencer* (1906); *Heredity* (1908; 2d ed., 1912); *The Bible of Nature* (1909); *Darwinism and Human Life* (1910); *The Biology of the Seasons* (1911); *Evolution* (1911), with Geddes; *Introduction to Science* (1911); *Sex* (1914), with Geddes; *The Wonder of Life* (1914).

THOMSON, Joseph (1858–95). A Scottish traveler and explorer. He was born in Dumfriesshire, and after studying at Edinburgh under Sir Archibald Geikie joined Keith Johnston's east central African expedition (1878), and after Johnston's death became leader in June, 1879. He reached Lake Tanganyika, and then started to go to the Congo, but was held back by his carriers. He discovered Lake Rukwa and afterward went to Bagamoyo on the coast, whence he sailed to London. He headed an expedition to Masai Land in 1882; went to Sokoto in behalf of the Royal Niger Company in 1885, when he secured a part of the Central Sudan to Great Britain; and, after exploring the Atlas Mountains in Morocco (1888), visited the region between lakes Nyassa and Bangweolo. In all his journeys he showed great tact and presence of mind and avoided serious conflict with the natives. He published *To the Central African Lakes and Back* (1881); *Through Masai Land* (1885; rev. ed., 1887); *Ulu: An African Romance* (1888), with Miss Harris-Smith; *Travels in the Atlas and Southern Morocco* (1889); and *Mungo Park and the Niger* (1890). He also wrote a large number of articles on his explorations, and on geographical and geological subjects. Consult J. B. Thomson, *Joseph Thomson, African Explorer* (London, 1896).

THOMSON, Sir Joseph John (1856–1940). An English physicist. He was born near Manchester and was educated at Owens College in that city and at Trinity College, Cambridge, where he graduated with honors in 1880. In 1884 he became Cavendish professor of experimental physics at Cambridge, and in 1905 was appointed professor of physics in the Royal Institution. At Princeton University in 1896 he delivered a series of lectures, published in 1897 as *Discharge of Electricity through Gases*. In 1903 he again visited the United States, where he received honorary degrees from Columbia, Princeton, and Johns Hopkins. Thomson was awarded medals by the Royal Society, the Hodgkins medal of the Smithsonian Institution (1902), and the Nobel prize in physics for 1906. He was knighted in 1908 and received the Order of Merit. To Thomson, more than to any one else, is due the development of the modern ionic theory of electricity, the theoretical and experimental discussion of radioactivity, and the electrical theory of inertia of matter. His papers on these subjects were epoch making. (See X Rays.) In 1914 he delivered at Oxford the Romanes lecture, which appeared as *The Atomic Theory*. He published also: *On the Motion of Vortex Rings* (1883); *Application of Dynamics to Physics and Chemistry* (1888); *Recent Researches in Electricity and Magnetism* (1893); *Elements of the Mathematical Theory of Electricity and Magnetism* (1895); *Conduction of Electricity through Gases* (1903); *Electricity and Matter* (1904), Silliman lectures at Yale; *Corpuscular Theory of Matter* (1907); *Rays of Positive Electricity and their Application to Chemical Analyses* (1913); *Thermochemistry* (1915). With J. H. Poynting (q.v.) he wrote *A Text Book of Physics* (1899–1914). In another field Thomson identified himself with the Society for Psychical Research.

THOMSON, Thomas (1773–1852). A Scottish chemist, born at Crieff, Perthshire. He was educated at St. Andrews and at Edinburgh. As early as 1802 he published a *System of Chemistry*. In 1817 he was appointed lecturer, and in 1818 regius professor of chemistry at the University of Glasgow. Thomson was the first to publish (*System of Chemistry*, 3d ed., 1807) a detailed account of Dalton's atomic theory, which had been communicated to him in a private interview (1804) and which Dalton himself did not publish until 1808. He was also the first English chemist to give laboratory instruction to students. His works include: *Elements of Chemistry* (1810); *An attempt to Establish the First Principles of Chemistry by Experiment* (1825; the analytical data of the elements were shown by Berzelius to be far from accurate); *Chemistry of Organic Bodies* (1838); *History of Chemistry* (1830–31); *History of the Royal Society* (1812); *Outlines of Mineralogy and Geology* (1836).

THOMSON, Sir William. See Kelvin, William Thomson, first Baron.

THOMSON, William McClure (1806–94). An American Presbyterian missionary and writer. He was born in Springfield (now Spring Dale), Ohio, and graduated at Miami College (1826); studied at Princeton Theological Seminary; and went as a missionary of the American Board to Syria and Palestine (1833). The next year he went to Beirut and there resided till his return to America in 1876. His reputation rests upon his familiar work, *The Land and the Book,* *Biblical Illustrations Drawn from the Manners and Customs, the Scenes and the Scenery of the Holy Land* (1859; 2d ed., 3 vols., 1880–85; reissue, 1 vol., 1911).

THOMSON EFFECT. A thermal effect in an electric circuit where the temperature of the wire carrying the current varies from point to point. When the current is flowing in one direction along such a conductor, heat will be liberated at a given point, whereas if the current is reversed the heat at this point will be absorbed. The relative direction of the current and the absorption or liberation of heat depend upon the metal. See THERMOELECTRICITY.

THOMSONITE, tŏm′sŭn-īt. See CHLORASTROLITE.

THOR, thôr (Icel. *þórr*, thunderer; cf. Lat. *tonare*, Ger. *donner*). In Scandinavian mythology, the god of thunder. He was the son of Odin and Frigg, while his wife was Sif the Delighter. His palace, where he received the warriors who had fallen in battle, was called Bilskirnir. Thunder was caused by the rolling of his chariot, which was drawn by he-goats. He was in the vigor of youth, had a red beard, and was the strongest of all the gods. He was a terror to the giants, with whom he was perpetually at strife, and whom he struck down with his hammer Mjölnir, or the smasher, which returned to his hand after being hurled. In the contest at the twilight of the gods Thor slew the serpent of Midgard, but fell at the same time poisoned by the venom exhaled from its mouth. The name of Thor was widespread. The Saxons worshiped him as Thunar, and Torden, the wrathful deity dreaded by the Lapps, is evidently the Scandinavian Thor. The Gallic god Tarannis, or Tanarus, appears also to be identical. Of all the Æsir (q.v.), Thor had unquestionably the most worshipers. In Norway he was the national god, and there, as in Iceland, temples were almost exclusively erected to him. Offerings were made to him, particularly in times of pestilence. Thursday was named for him. The heathen Scandinavians marked their rune stones with the sign of the hammer of Thor. See RAGNARÖK; SCANDINAVIAN AND TEUTONIC MYTHOLOGY.

THORACIC (thô-răs′ĭk) **DUCT** (from Lat. *thorax*, from Gk. θώραξ, breastplate, part of the body covered by the breastplate, thorax). A canal equal in diameter to a goose quill, proceeding from the receptaculum chyli (into which the contents of the lacteals are collected, and which is situated in the front of the body of the second lumbar vertebra), which ascends along the front of the vertebral column, between the aorta and ascending vena cava, as high as the fourth dorsal vertebra; it then inclines to the left, and passing behind the arch of the aorta, ascends as high as the seventh cervical vertebra, when it bends forward and downward, and empties into the subclavian at its junction with the internal jugular vein of the left side, where it is provided with a pair of semilunar valves, which prevent the admission of venous blood into it. It is also provided with other valves on its upward course. It is the common trunk of all the lymphatic vessels of the body, excepting those of the right side of the head, neck, thorax, the right upper extremity, the right lung, right side of the heart, and the upper surface of the liver, the lymphatics of which empty into the right lymphatic duct, a vessel less than an inch long, which pours its contents into the right subclavian or internal jugular vein. This duct is not liable to any special diseases, but if its function of conveying chyle from its source into the general circulation be interfered with, by injury, hemorrhage, or inflammation, or by the pressure of a tumor, nutrition is impaired and there may be an accumulation of chylous fluid in the peritoneal cavity or pericardium or pleura, or there may be chyluria, or chylous œdema of the pelvis, genitals, or lower abdominal wall.

THORAH. See TORAH.

THO′RAX. See CHEST.

THORBECKE, tôr′bĕk-e, HEINRICH (1837–90). A German Arabic scholar. He was born at Meiningen, and studied at Munich and Leipzig. He was appointed professor at Heidelberg (1873) and at Halle (1885). He is especially noted for his knowledge of Arabic poetry. He published: *Antarah, ein vorislamitischer Dichter* (1867); *Al-Harîrî's Durrat-al-gawwas* (1871); *Al-A'schâ's Lobgedicht auf Mahammed* (1875); *Ibn Duraid's Kitâb al-malâhin* (1882); *Die Mufaddalîjât* (1885); *Mihail Sabbag's Grammatik der arabischen Umgangssprache in Syrien und Aegypten* (1886).

THOREAU, thō′rō *or* thô-rō′, HENRY DAVID (1817–62). An American naturalist and author, of French and Scotch extraction, born at Concord, Mass., where his father was a manufacturer of lead pencils. At this trade the younger Thoreau worked at intervals. He graduated from Harvard in 1837, and was for five or six years engaged in school teaching and tutoring in Concord and at Staten Island, N. Y. Preferring to live a life of contemplation, he abandoned teaching and proceeded, during the rest of his days, to demonstrate how simply and agreeably a man might live. He was for a time an inmate of Emerson's house, but his most characteristic act was his residence, from July, 1845, to September, 1847, in a hut on the shores of Walden Pond, a beautiful body of water on the outskirts of Concord. Here he lived, doing what little work was necessary to supply the necessaries of life, and devoting the major part of his time to the study of nature and to the society of friends. On leaving Walden he again lived with Emerson, 1847–48, and the years after 1849 were spent with his parents and sister at Concord. During his life at Walden Pond and elsewhere in Concord, he supported himself by odd jobs of gardening, land surveying, carpentering, etc., but without more exertion than he needed to keep himself in food and clothing. His leisure time he devoted to the study of nature, to the reading of Greek, Latin, French, and English classical literature, to excursions, to pondering metaphysical problems, and to friendly chat with his neighbors, by whom he was beloved.

From 1837 till his death he kept a journal, and this furnished the source and basis of his writings, and gave them uniformity of character. Of the volumes which comprise his works in the standard Riverside edition (11 vols., with the *Familiar Letters* of Thoreau edited by F. B. Sanborn) but two appeared in his lifetime. The first of these, *A Week on the Concord and Merrimac Rivers* (1849), is the narrative of a boating trip taken in August, 1839; it is full of admirable description and minute observation of nature, mingled with excursions into transcendental philosophy. The second book records the experiences, physical and moral, of his two years at Walden Pond: *Walden, or, Life in the Woods* (1854), perhaps his most popular volume, recognized as one of the most original and sincere productions in American letters and as one of the most genuine of woodland books. It gives a plain unaffected statement of the reasons for the author's life as a hermit, and an admirably specific account of the main details of that life. The other volumes, largely made up of material from his journal, and edited and published posthumously, are: *Excursions* (1863); *The Maine Woods* (1864); *Cape Cod* (1865); *Early Spring in Massachusetts* (1881); *Summer* (1884); *Winter* (1888); *Autumn* (1892); and *Miscellanies* (1894). In 1905 appeared *The First and Last Journeys of Thoreau, lately discovered among his unpublished Journals and Manuscripts* (ed. by F. B. Sanborn, Boston). A new and complete edition was published in 1906. Their publication indicated an increasing interest in Thoreau and a sense of the permanent value of his work. The literary quality of the writing was high; he had a marked gift for style, and wrote with great care and unfailing freshness. His best essays, to be found in the volumes entitled *Miscellanies* and *Excursions*, are perhaps not excelled in American literature, whether for substance or for style, and it may be doubted whether the work of any of his contemporaries is wearing as well. His poems are interesting, but occupy a minor place in his writings.

Bibliography. A. H. Japp, *Thoreau: His Life and Aims* (Boston, 1877); H. S. Salt, *Life of David Henry Thoreau*, in "Great Writers Series" (New York, 1896); F. B. Sanborn, *Henry D. Thoreau*, in "American Men of Letters" (Boston, 1896); A. R. Marble, *Thoreau: His Home, Friends, and Books* (New York, 1902); W. E. Channing, *Thoreau: The Poet-Naturalist* (new ed., Boston, 1902); R. W. Emerson, in *Biographical Studies* (Centenary ed., ib., 1903); Bradford Torrey, in *Friends on the Shelf* (ib., 1906); Arthur Rickett, *The Vagabond in Literature* (New York, 1906); P. E. More, in *Shelburne Essays, First and Fifth Series* (ib., 1907–08); W. M. Payne, in *Leading American Essayists* (ib., 1910).

THORESEN, tō′rā-sen (Anna) Magdalene (Kragh) (1819–1903). A Norwegian poet, born at Fredericia, in Denmark. She married a Norwegian clergyman and gained opportunity to study the peasant life and wilder nature of that country. Her sympathetic observations found literary expression in *Fortællinger* (Tales, 1863); *Signes Historie* (1864); *Solen i Siljedalen* (1868); *Billeder fra Vestkysten af Norge* (Pictures from the West Coast of Norway, 1872); *Nyere Fortællinger* (1873); *Herluf Nordal* (1879); she published also two volumes of poems (1860 and 1887); several dramas, among them *Et Rigt Parti* (1870), the story *Billeder fra Midnatsolens Land* (2 vols., 1884–86), and a final volume of tales (1899). Her earlier fiction was translated into German by Reinmar: *Gesammelte Erzählungen* (5 vols., Berlin, 1878–1883). Consult her biography by Clara Bergsöe (Copenhagen, 1904).

THORGILSSON, Ari. See Ari Thorgilsson.

THO′RITE. A mineral thorium silicate crystallized in the tetragonal system. It has a vitreous lustre, and is orange yellow to dark brown in color. It is found at various places in Norway, where, owing to the uranium oxide that it contains, it is called *uranothorite.*

THO′RIUM (Neo-Lat., from *Thor*, Scandinavian god of thunder). A metallic element discovered by Berzelius in 1828. It occurs in monazite, orangite, thorite, and other minerals containing the cerium group of metals, and found in Brazil, Norway, and in North and South Carolina. For the extraction of thorium, monazite sand is heated with strong sulphuric acid, then cold water is added, and the resulting solution is separated from the insoluble residue and partially precipitated with alkali; the precipitate is dissolved in hydrochloric acid, and from this acid solution the thorium is precipitated, in the form of its oxalate, with oxalic acid. The metal itself may be obtained by decomposing thorium chloride with potassium or sodium. Thorium (symbol, Th; atomic weight, 232.4) is a gray powder which assumes an iron-gray lustre when burnished. It has a specific gravity of about 11 and takes fire when heated in air, burning with a bright flame. It combines with oxygen, forming a white dioxide (ThO_2), called thoria, and a peroxide. None of the compounds of thorium have any important commercial value except the dioxide, which has been used with ceria in the mantle of the Welsbach burner. Thorium is a distinctly radioactive element, its gradual disintegration producing a series of elements of more or less ephemeral existence, like the series yielded by radium. See Radioactivity.

THORN. See Cratægus.

THORN, tôrn. A strongly fortified town of Prussia, in the Province of West Prussia, on the right bank of the Vistula, which here divides into two branches, 87 miles northeast of Posen (Map: Germany, H 2). There are many antique houses with striking architectural features. The ruins of a castle of the Teutonic Order, the church of St. John (1231–60), the Gothic St. James (1309), and the Marienkirche (1367) are worthy of notice, also a town hall with museum, library, and archives. In the market place stands a bronze statue of Copernicus, who was born here. There are iron foundries, and machine, tobacco, and soap works. The town carries on trade by water and rail in corn, lumber, mineral waters, chocolate, gingerbread, and alcohol. Thorn was founded in 1231 by the Knights of the Teutonic Order. It became an important member of the Hanseatic League. It was annexed in 1454 to Poland. In 1466 a treaty of peace was concluded here between Poland and the Teutonic Knights (q.v.). The town became a part of Prussia in 1793. Pop., 1900, 29,626; 1910, 46,227. In the early part of the Great War which began in 1914 Thorn was bombarded and seriously threatened by the Russians. (See War in Europe.) Consult Kestner, *Beiträge zur Geschichte der Stadt Thorn* (Thorn, 1883).

THORN, Christ's. See Jujube.

THORNABY (thôr′nȧ-bĭ) **ON TEES,** formerly South Stockton (Map: England, E 2). A municipal borough in the North Riding of Yorkshire, England, suburban to Stockton, with which its manufacturing industries and public works are identified. It is mentioned as Thormodby in Domesday. Pop., 1901, 16,053; 1911, 18,605.

THORN ACACIA. See Locust Tree.

THORN APPLE. See Stramonium.

THORN′DIKE, Ashley Horace (1871–). An American English scholar, brother of Edward L. Thorndike. He was born at Houlton, Me., and graduated at Wesleyan University in 1893, later taking higher degrees at Harvard. After serving as principal of Smith Academy, Hatfield, Mass., and teaching at Boston University and at Western Reserve, he held a chair at Northwestern (1902–06), and served thereafter as professor of English at Columbia. He wrote: *Influence of Beaumont and Fletcher on Shakespeare* (1901); *Elements of Rhetoric and Composition* (1905); *Tragedy* (1908); *Everyday English* (1913); *Shakespeare's Theatre* (1916).

THORNDIKE, Edward Lee (1874–). An American psychologist, brother of Ashley H. Thorndike. He was born at Williamsburg, Mass., and graduated from Wesleyan University in 1895, from Harvard in 1896, and from Columbia (Ph.D.) in 1898. In 1898–99 he taught at Western Reserve University, and afterward was identified with Teachers College, Columbia, where by 1904 he had become professor of educational psychology. In 1912 he was president of the American Psychological Association. Besides monographs and articles, he published: *The Human Nature Club* (1901); *Educational Psychology* (1903; 3d ed., 3 vols., 1913–14); *Mental and Social Measurements* (1904; 2d ed., rev., 1913); *The Elements of Psychology* (1905); *Principles of Teaching* (1905); *Animal Intelligence* (1911); *Education: A First Book* (1912); *The Measurement of Ability in Reading* (1914); *Educational Psychology, Briefer Course* (1914).

THORNE, Will(iam James) (1857–). An English labor leader and Socialist, born at Birmingham. He began to work when six years old. He founded the National Union of Gasworkers and General Laborers in 1889, and thereafter was its general secretary. He was elected in 1890 to the town council of West Ham, of which he was deputy mayor in 1898, and he entered the House of Commons in January, 1906.

THORN′HILL. A town in the West Riding of Yorkshire, England, 1½ miles south of Dewsbury. It is a prosperous woolen-milling town and also manufactures carpets and shoddy. Pop., 1901, 10,290; 1911, 10,974.

THORN′TON, Sir Edward (1817–1906). An English diplomat. He was born in London and was educated at King's College, London, and at Pembroke College, Cambridge. He entered the diplomatic service as attaché to the mission at Turin in 1842, filled the same position in Mexico in 1845, and was made Secretary of Legation in that capital in 1853. During 1848 he did much to forward the conclusion of the important Treaty of Guadalupe Hidalgo. In 1852 he was appointed Secretary of Legation at Buenos Aires; chargé d'affaires to Uruguay (1854); Minister to the Argentine Republic in 1859, to Brazil in 1865, and from 1867 to 1881 to the United States. He was knighted in 1870; in 1871 was a member of the commission on the Alabama Claims, and was appointed Privy Councilor; and in 1873 was arbitrator in the commission on the Mexican and United States claims. He was appointed Ambassador at St. Petersburg in 1881, Ambassador at Constantinople in 1884, and retired to private life in 1887.

THORNTON, John Wingate (1818–78). An American historian, born at Saco, Me. He graduated at the Harvard Law School in 1840, and became a practicing lawyer. His great interest, however, lay in genealogical and historical work, and he published a number of books along these lines, including: *The Landing at Cape Ann* (1854); *The First Records of Anglo-American Colonization* (1859); *The Pulpit of the American Revolution* (1860). He was the founder of the New England Historical and Genealogical Society (1844). Consult Amory, *Memoir of J. W. Thornton* (Boston, 1879).

THORNTON, Matthew (1714–1803). A signer of the Declaration of Independence. He was born in Ireland; went to America in 1717, lived at Wiscasset, Me., and later at Worcester, Mass., where he was educated; settled as a physician at Londonderry, N. H., and was surgeon under Sir William Pepperell in the Louisburg expedition of 1745. He was president of the provincial convention of 1775, and in 1776 was a delegate to the Continental Congress, taking his seat in November, when he was allowed to sign the Declaration of Independence, though not elected until after its passage. He was Chief Justice of the Court of Common Pleas prior to 1776, and from 1776 to 1782 was a judge of the New Hampshire Supreme Court.

THORNTON, William (1762–1828). An American architect, born on Tortola Island in the West Indies. He was without technical training, but cultivated the study of classic architecture as a gentleman amateur, and in 1793 submitted plans for the proposed Capitol at Washington to the Commissioners of the District of Columbia. These plans were approved by President Washington, and their execution was begun under the superintendence of Stephen Hallet, a Frenchman, and James Hoban (q.v.); but in 1794 Thornton, who had come to the United States meanwhile, was appointed a commissioner of the District, and in that capacity until 1802 supervised the work. His design, though later modified in detail, survives in the central block of the Capitol, in spite of the fire of 1814. He also designed the "Octagon" mansion at Washington. From 1802 until the time of his death Thornton held the office of Commissioner of Pensions.

THORN′WELL, James Henley (1812–62). An American Southern Presbyterian theologian. He was born in Marlborough District, S. C., and graduated at South Carolina College, Columbia, in 1829. He held several pastorates; was for a time president of South Carolina College, and held professorships in the theological seminary at Columbia. He published *Arguments of Romanists Discussed and Refuted* (1845), *Discourses on Truth* (1854), *On the Rights and Duties of Masters* (1861), *The State of the Country* (1861), and was one of the most orthodox and conservative of theologians. His collected writings were published at Richmond (1871–73). Consult his *Life and Letters* by B. M. Palmer (Richmond, 1875) and J. L. Girardeau (1871–73).

THORN′YCROFT′, Sir John Isaac (1843–). An English naval architect, brother of William Hamo Thornycroft. He was born in Rome. Early showing an aptitude for mechanics, at 18 he built a steam launch, the *Nautilus*, which was the fastest boat of its kind on the Thames. Earlier, he had constructed a little model steamer which contained several important innovations afterward introduced by him into his torpedo boats. After completing the engineering course at the University of Glasgow, he opened a shipyard at Chiswick in 1866, and achieved remarkable success as a builder of torpedo boats. Among his improvements were the closed stoke-hole and fan, a special indicator, a water-tube boiler, and the turbine propeller. He contributed to the *Transactions of the British Association* and to the publications of the Institution of Naval Architects (of which he became vice president) and the Institution of Civil Engineers. In 1902 he was knighted.

THORNYCROFT, William Hamo (1850–). An English sculptor, the son of Thomas Thornycroft (1815–85), a sculptor of classical tendencies, and Mary Thornycroft, a pupil of John Gibson, who carved many statues and busts of the royal family for Queen Victoria. He was born in London and studied with his father, at the Royal Academy Schools, and also in Italy. He first won recognition with his "Warrior Bearing a Wounded Youth" (1876). His ideal figures were at first conceived in a strongly classic spirit with much beauty and purity of taste. To this style belong such works as "Lot's Wife" (1878); "Artemis" (1880, Duke of Westminster, Eaton Hall, Chester); "Teucer," perhaps his masterpiece (1881, Tate Gallery, London), and "Medea" (1888). He afterward became more modern in treatment and spirit, as may be seen in the "Mower" (1884, Liverpool Gallery), and the "Sower" (1886). Among his many public monuments, the most notable include the Stanley Memorial (1898, Holyhead Church); the General Gordon monument in Trafalgar Square, London; the statue of Queen Victoria in the Royal Exchange; Bishop Goodwin of Carlisle (1895, Carlisle Cathedral); Cromwell (1900, Westminster); the colossal "King Alfred" (1901, Winchester); the Gladstone Monument (Strand, London); the Armstrong Memorial (Newcastle); and the statue of Tennyson (1909, Trinity College, Cambridge). He also executed some notable work in relief and in decorative sculpture. Thornycroft was elected a member of the Royal Academy (1888), honorary member, Royal Academy of Munich (1889), and received gold medals at the Royal Academy (1875) and in Paris (1900). See Thornycroft, Sir John Isaac.

THÓRODDSEN, thŏr′ŏd-sen, Jón Thordarson (1819–68). An Icelandic poet and novelist, born at Reykhólar. After studying law at the University of Copenhagen, he took part in the war against the Schleswig-Holstein insurgents and in 1850 returned to Iceland. He died at Borgarfjartharsysla. In point of both time and excellence, Thóroddsen is the first Icelandic novelist. His best-known works are his first novel, *Piltur og Stúlka* (Lad and Lass) (1850; many editions; Ger., Dan., and Dutch trans.), and *Mathur og Kona* (Man and Wife), published posthumously (1876). These books are characterized by a faithful delineation of Icelandic life and by a quaint and pleasing humor. Thóroddsen also wrote a number of witty and satirical poems, published in 1871. Consult Poestion, *Isländische Dichter der Neuzeit* (1897).

THOROLD, thŏ′rūld. A town in Welland County, Ontario, Canada, on the Welland Canal and on the Grand Trunk and the Niagara, St. Catherines, and Toronto Electric railways (Map: Ontario, F 7). It has a public library. There are various manufactures. Pop., 1901, 1979; 1911, 2273.

THOR′OLD, Anthony Wilson (1825–95). An English bishop. He was born at Hougham in Lincolnshire; graduated at Queen's College, Oxford, in 1847; entered the ministry, and filled prominent livings in London from 1857 till he became Bishop of Rochester in 1877. In 1890 he was transferred to Winchester. He is best known as the author of the devotional works, of rare spirituality: *The Presence of Christ* (1869); *The Gospel of Christ* (1882); *The Yoke of Christ* (1884); *Questions of Faith and Duty* (1892); *The Tenderness of Christ* (1894). Consult his *Life by Simpkinson* (London, 1896).

THOROUGHBASS. See Figured Bass.

THOROUGHWORT. See Boneset; Eupatorium.

THORPE, Benjamin (1782–1870). An English philologist who studied at Copenhagen under the famous philologist Rasmus Kristian Rask (q.v.). While there he published a translation of Rask's *Anglo-Saxon Grammar* (1830; rev., 1865). Returning to England (1830), he continued his studies in Old English and Old Norse. Most widely known in his *Northern Mythology, comprising the principal popular Traditions and Superstitions of Scandinavia, North Germany, and the Netherlands* (3 vols., 1851). This was supplemented by *Yule Tide Stories: A Collection of Scandinavian Tales* (1853) and a translation of the *Edda of Sæmund the Learned* (1866). Thorpe's pioneer work in Old English translation, philology, and history is still of great value. Among his publications in this department are *Cædmon's Metrical Paraphrase* (1832); *Analecta Anglo-Saxonica* (1834; 3d ed., 1868); *Ancient Laws and Institutes of England* (1840); *Codex Exoniensis, a Collection of Anglo-Saxon Poetry, with English Translation and Notes* (1842); *Anglo-Saxon Poems of Beowulf, with a Literal Translation, Notes, and Glossary* (1855); *The Anglo-Saxon Chronicle, according to the several Original Authorities* (2 vols., 1861); and *Diplomatarium Anglicum Ævi Saxonici: A Collection of English Charters* from 605 to 1066 (1865).

THORPE, Sir Edward (1845–). An English chemist. He was born near Manchester and was educated at Owens College, where he came under the influence of Sir Henry E. Roscoe (q.v.). Later he studied at Bonn and Heidelberg (Ph.D.). He was professor successively in the Andersonian Institution, Yorkshire College, Leeds, and the Royal College of Science, London. In 1909 he was knighted. At various times he served as president of the Society of Chemical Industry, the Chemical Society of London, and the chemical section of the British Association. Besides many addresses and important papers he published: *Chemical Problems* (1870); *Qualitative Analysis* (1873); *Quantitative Analysis* (1873); *Inorganic Chemistry* (2 vols., 1874); *A Dictionary of Applied Chemistry* (3 vols., 1893; 5 vols., 1912); *A History of Chemistry* (2 vols., 1909–10).

THORPE, Francis Newton (1857–). An American historian, born at Swampscott, Mass. He was educated at Syracuse University and at the Law School of the University of Pennsylvania. From 1885 until 1898 he was fellow, and professor of American constitutional history, at the University of Pennsylvania. In 1910 he accepted the chair of political science and constitutional law at the University of Pittsburgh. He published: *The Government of the People of the United States* (1889); *A Constitutional History of the American People, 1776–1850* (2 vols., 1898); *The Constitutional History of the United States, 1765–1895* (3 vols., 1901); *Short Constitutional History of the United States* (1904); *An American Fruit Farm* (1915). He edited *The History of the Civil War—National View* (1906) and *The Statesmanship of Andrew Jackson* (1909).

THORPE, Rose Hartwick (1850–). An American author, born at Mishawaka, Ind. In 1871 she was married to E. Carson Thorpe. She became best known for her ballad *Curfew Must Not Ring To-Night* (1882). The *Poetical*

Works of Rose Hartwick Thorpe were published in 1912. In addition to verse she wrote several stories.

THORVALDSEN, tôr′wạld-sĕn (Ger. Thorwaldsen), Bertel (1770–1844). An eminent Danish sculptor, the most important and gifted exponent of classicism in sculpture (q.v.) in the nineteenth century. He was born at Copenhagen, Nov. 19, 1770, the son of an Icelandic carpenter and carver of figures upon galleons. He was sent to the academy at the age of 11, and received, in 1793, the great gold medal, with a stipend for three years' study at Rome. This city, however, he did not reach until March, 1797. In Rome he was less influenced by the master works of antiquity than by Carstens (q.v.) who had already been his model at Copenhagen. On the point of returning home, in 1803, he received a commission from Sir Thomas Hope to execute in marble the colossal statue of "Jason with the Golden Fleece," the plaster cast of which had called forth the admiration of all connoisseurs and critics, and even of Canova. Orders now came in abundance, especially after he had finished the spirited relief of the "Abduction of Briseis," one of his most perfect creations in the realm of relief sculpture. In 1804 he produced the famous group of "Cupid and Psyche," and the relief of "Dance of the Muses on Mount Helicon," and in 1805 the statues of "Apollo," "Bacchus," and "Ganymede," which was later followed by a "Ganymede Filling the Cup," and the graceful group of "Ganymede Watering the Eagle of Zeus." With his increasing reputation came new distinctions and honors; in 1804 the Florence Academy appointed him professor and in 1808 he was elected a member of the Accademia di San Luca in Rome, sending as his reception piece the relief "A Genio Lumen." About 1809 Thorvaldsen won a new patron in Crown Prince Louis of Bavaria, who sought his advice in purchasing antique works of art and commissioned him to execute a statue of "Adonis" (1832, Glyptothek, Munich).

To the year 1809 belong four of his most attractive reliefs, the group of "Hector, Paris, and Helena," and three other mythological subjects, and in 1810–11 he carved the life-size statue of "Psyche," one of his creations approaching nearest to the spirit of antique art, and a heroic-sized "Mars Weighing Cupid's Arrows." In honor of the proposed visit of Napoleon to Rome he was commissioned to model a frieze representing the "Entry of Alexander the Great into Babylon," with which he achieved prodigious success. The marble version found a permanent home in the Villa Carlotta on Lake Como, and a modified replica was acquired by the Danish government for Kristiansborg Castle. From a purely artistic point of view the "Memorial to Baroness Schubart" (1814) is most akin to the Greek reliefs of the fourth century B.C., and of his compositions dating from 1814–15, the medallions of "Morning" and "Night" have probably given him the widest reputation. In 1816–18 he produced "Venus with the Apple," "Hebe," "Cupid Triumphant," "Bacchante Dancing," "Shepherd Boy Resting," "Mercury, Slayer of Argus," and "The Three Graces." The latter subject he treated even more successfully in the high relief for the tomb of the Milanese painter Appiani. A series of charming reliefs with Cupid as the central figure date from the same period. The year 1819 saw the realization of the unique "Lion of Lucerne," a memorial to the Swiss guards who fell guarding Versailles Palace, chiseled out of the natural rock by the Swiss sculptor Ahorn after Thorvaldsen's model.

Arriving at Copenhagen in October of the same year, he was received with great honors. He received a commission for the plastic decoration of Vor Fruekirke (Church of Our Lady), with figures, groups, and reliefs, executed subsequently in Rome. They comprise the colossal statue of "Christus Consolator," one of his masterpieces, the statues of the "Twelve Apostles," and the reliefs of the "Institution of Baptism" and of the "Institution of the Holy Communion." The Christ was finished by his own hand, the others with the assistance of his pupils after his return to Rome. He left Copenhagen in 1820 and, having arranged at Warsaw for the erection of his equestrian statue of Prince Poniatowski and the Copernicus Monument, returned to Rome, where he devoted himself zealously to his new commissions. To these were added the "Monument to Pope Pius VII" in St. Peter's (1831), and the statue of Lord Byron (1835, Trinity College, Cambridge). A statue of "Hope" (1829) adorns the tomb of the Humboldt family in the park at Tegel, near Berlin.

In 1825 Thorvaldsen was elected president of the Accademia di San Luca in Rome, notwithstanding the objections to him as a Protestant. Important works, other than those already mentioned, are the statue of Duke Eugene of Leuchtenberg, in St. Michael's Church, Munich, and the equestrian statue of the "Elector Maximilian I" (Munich), the first instance in which he represents an historical personage in the costume of the time. This was done most successfully in the statue of Conradin, Last of the Hohenstaufen, in Santa Maria del Carmine, at Naples. Besides reliefs of antique subjects, he produced in the thirties the figure of a "Young Dancer" (1837, Palazzo Torlonia) and a colossal statue of "Vulcan," one of his last works at Rome.

His return, consequent upon the King's request, was made in a royal Danish frigate. Besides his monumental tasks for the Fruekirke, it was principally reliefs from Greek mythology that now claimed his attention, and in the spring of 1841 he repaired once more to Rome to finish some subjects he had left behind. His journey through Germany was a triumphal progress, and after one year in Rome he returned to Copenhagen, devoting himself to work in relief. The pieces known as "Christmas Joy in Heaven," "The Rape of Hylas," and the famous "Four Seasons" are the most remarkable. He died at the theatre, on March 24, 1844, and was escorted to his burial place with princely honors. His possessions were bequeathed to his native city for the establishment of the Thorvaldsen Museum, in which all his works, in the original or in plaster models, his sketches and studies, and his art collections are preserved, and in the court of which he lies buried. His art is the best which the so-called classicist tendency has produced in sculpture. Unlike Canova, his inspiration was Greek rather than Roman, and his works approach nearest of all to the purity and repose of Greek art. He excelled especially in relief and in ideal and mythological subjects. As he sought chiefly to attain general types, his art was deficient in characterization, and also in dramatic action.

Bibliography. J. C. Andersen, *B. Thorvaldsen* (Berlin, 1845); J. M. Thiele, *Life of Thorvaldsen*, translated from the Danish by M. R. Barnard (London, 1865); id., *Thorvaldsen and his Works*, English translation by Sinning (New York, 1869); Eugène Plon, *Thorvaldsen: sa vie et son œuvre* (2d ed., Paris, 1874); M. Hammerich, *Thorwaldsen und seine Zeit* (Gotha, 1876); H. Lücke, "Canova und Thorvaldsen," in Dohme, *Kunst und Künstler des neunzehnten Jahrhunderts*, vol. i (Leipzig, 1886); Julius Lange, *Thorwaldsen's Darstellung des Menschen*, German translation by Mathilde Mann (Berlin, 1894); Adolf Rosenberg, "Thorvaldsen," in *Künstlermonographien, No. 16* (Bielefeld, 1901).

THOS, thōz. A tall, non-Mongoloid people of Tonking, in the valley of the Claire River, with subbrachycephalic head form, a member of the Mois (q.v.) group of tribes. They are husbandmen, living in houses on piles, and wearing a very picturesque costume. The Thos and the Muongs (q.v.) of the valley of the Black River in Tongking may be regarded as one of the principal groups of the Thai stock, to which belong the Shans (q.v.), the Laotians (see Laos), and the Siamese. Consult Garcin, *Un an chez les Muongs au Tonkin* (Paris, 1891); De Lanessan, *L'Indo-Chine française* (ib., 1889); Pinabel, *Sur quelques peuples sauvages dépendant du Tong-King* (ib., 1884).

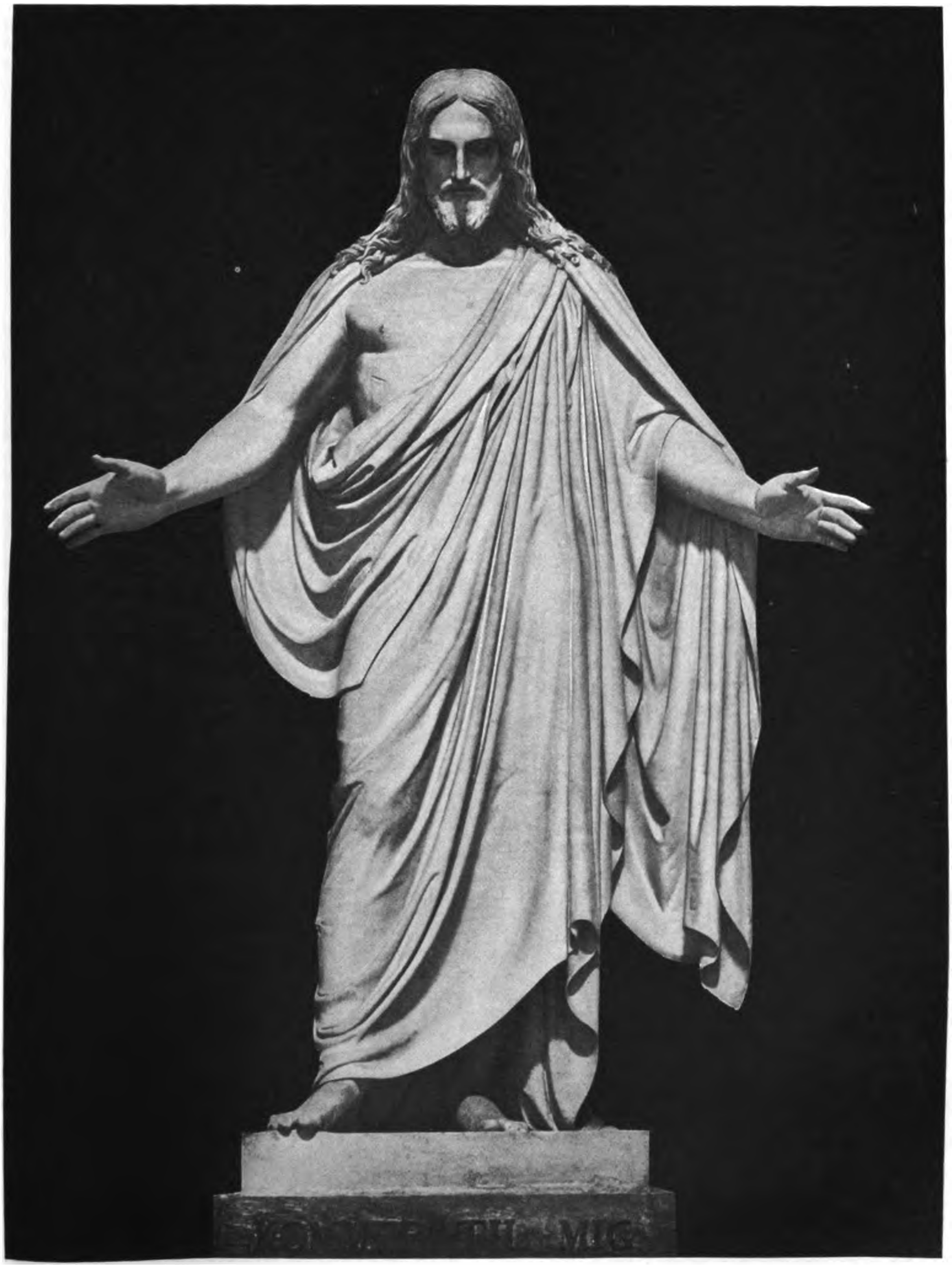
THOTH, thŏth *or* tōt (Gk. *Θώθ*, *Thōth*, *Θωύθ*, *Thōyth*, *Θεύθ*, *Theyth*, from Egypt. *Dhutī*). An Egyptian deity identified by the Greeks with Mercury (q.v.). Consult E. A. T. Wallis Budge, *The Gods of the Egyptians* (London, 1904). See Hermetic and Plate of Egyptian Deities.

THOTHMES, thŏth'mēz *or* tōt'mĕs (Egypt. *Dhutī-mose*, son of Thoth; Gk. *Τούθμωσις*, *Touthmōsis*) or Tahutimes. The name of four kings of Egypt of the eighteenth dynasty.

Thothmes I was the son and successor of Amenophis I (q.v.) and ascended the throne about 1560 B.C. According to Manetho, as cited by Africanus, he reigned for 22 years, though no date higher than his ninth regal year has as yet been found upon the monuments. The first recorded military expedition of Thothmes I was against the Nubians, whom he defeated, returning in triumph to Thebes with the body of their chief at the bow of his ship. In his third year he found it necessary to chastise the Nubian tribes in another expedition. Not long after, he invaded Asia and, marching as far as the Euphrates, set up a stele which was later seen and mentioned by Thothmes III. The remainder of his reign seems to have been peaceful and was largely devoted to building operations. At Karnak (q.v.) he built two pylons and two hypostyle halls, and erected two obelisks, one of which (76 feet high) is still standing. (See Obelisk.) He also constructed buildings in the necropolis of Thebes, at Abydos, at Ibrim (a rock-hewn chapel), and at other places. The coffin of Thothmes I was found in 1881 at Deir el Bahri, but whether the mummy it contained is that of the King is not altogether certain.

Thothmes II, the son and successor of Thothmes I, reigned for about nine years, according to the monuments, and according to Manetho for 12 or 13 years. An inscription at Assuan, dated in the first year of his reign, states that he sent an expedition against Nubian tribes who had raided his territory, and he seems to have fought against the Asiatic Bedouin, but he undertook no extensive wars. He made additions to the great Temple of Ammon at Karnak, and his name is inscribed upon buildings in many parts of Egypt. The mummy of the King, found in 1881 at Deir el Bahri, is that of a young man, apparently not over 30 years of age. His sister and wife, the able and energetic Hatshepsut (see Hatasu), was coregent throughout his reign, and was the real ruler of the kingdom.

Thothmes III was one of the greatest of all the Egyptian monarchs. The evidence as to his parentage is not altogether clear, but in all probability he was the son of Thothmes I by a wife named Iset, or Isis, and the half brother of the great Queen Hatshepsut (Hatasu). In a short time the party of Hatshepsut was able to thrust Thothmes III into the background. Her rule was, however, soon terminated for a while by the coalition of Thothmes I and II who got control and ruled together until the death of the former gave the party of Thothmes III a chance to regain the throne. The Queen, however, was powerful enough to dominate and until her death the government seems to have been in her hands, while she seems to have allowed Thothmes III merely a nominal share in the government. As soon as her death left him sole ruler he entered upon a career of conquest unrivaled in the annals of Egyptian history. Assembling an army for the invasion of Syria, he celebrated the twenty-third anniversary of his accession at Gaza. Marching thence through the passes of Mount Carmel, he defeated the allied Syrian forces on the plain of Esdraelon and forced them to take refuge in the city of Megiddo, which capitulated after a brief siege. The captive Syrian chiefs were restored to their dignities as vassals of Egypt, and Thothmes, after receiving messages of congratulation from many foreign princes, among them the King of Assyria, returned laden with booty. The conquest was not yet complete. Some of the Syrian and Phœnician cities offered stubborn resistance and there were frequent revolts, opponents of Egypt being encouraged and supported by the powerful State of Mitanni (see Amarna Letters), which at that time occupied northern Syria and northern Mesopotamia. War with this state soon followed, in the course of which Thothmes ravaged Mitannian territory and captured a number of cities, including the important city of Carchemish, on the Euphrates. He gained no permanent possessions in this quarter, but the result of the war enabled him to extend his dominions, undisturbed by Mitannian interference, over northern Palestine and Phœnicia. At the city of Ni, near the Lower Orontes, he set up a stele to mark the limit of the Egyptian Empire in that quarter. During his reign Thothmes conducted at least 14 Asiatic campaigns, and the booty and tribute he obtained were lavished upon the Egyptian temples. In the fiftieth year of his reign he caused the old canal at the first cataract of the Nile to be cleared and sailed through it on an expedition against the Nubians. As a builder Thothmes was hardly less energetic than as a warrior, and his monuments occur throughout Egypt and Nubia. He made important additions to the great Temple of Ammon at Karnak and caused his annals to be inscribed upon its walls, and he also built at Heliopolis, Memphis, Abydos, Hermonthis, Edfu, Esneh, Ombos, and other places. In Nubia, where he built or restored



THORVALDSEN

"CHRIST," FROM THE STATUE IN THE CHURCH OF OUR LADY AT COPENHAGEN

many temples, he was the founder of the large temple at Soleb, near the third cataract. Thothmes III died about 1485 B.C. (Breasted says 1447); his mummy was among those found at Deir el Bahri in 1881.

Thothmes IV, the son of Amenophis II (q.v.) and the grandson of Thothmes III, ruled for nine years from about 1460 B.C. He conducted military expeditions to Nubia and to Phœnicia, collecting booty and tribute in both countries, and an inscription at Ghizeh records that he cleared away the sand from the great Sphinx (q.v.). From the Amarna tablets it appears that he maintained friendly relations with Babylonia and with Mitanni, and married the daughter of Antatama, King of the latter country.

Consult: Eduard Meyer, *Geschichte des alten Ægyptens* (Berlin, 1887); W. M. Flinders Petrie, *A History of Egypt* (New York, 1897); E. A. T. Wallis Budge, *A History of Egypt* (ib., 1902); Max Müller, "Die alten Ægypter als Krieger und Eroberer in Asien," in *Der alte Orient*, vol. v (Leipzig, 1903); J. H. Breasted, *Ancient Records of Egypt* (5 vols., Chicago, 1907); id., *A History of the Ancient Egyptians* (New York, 1908).

THOU, tōō, Jacques Auguste de (1553–1617). A French historian, born in Paris. He studied jurisprudence at Orleans and Valence and in 1576 became an ecclesiastical councilor of the Parlement of Paris. He was an active member of the *Politiques* (q.v.). De Thou was made keeper of the Royal Library and vice president of the Parlement by Henry of Navarre. In 1591 he began his great work, the *Historia Sui Temporis*, which covered the period from the death of Francis I to that of Henry IV (1547–1610), and which occupied him during the remainder of his life. He took an important part in the drawing up of the Edict of Nantes. The history was completed by Rigault from materials left by De Thou and comprises in its full form 143 books. The work is marked by striking fairness and a faithful adherence to fact, remarkable in a history dealing with a period of bitter partisan spirit, civil war, and anarchy. The history was published in 11 volumes (Paris, 1609–14) and 4 volumes (Frankfort, 1625), both in Latin. A French translation appeared in 10 volumes (Paris, 1740), and one in English by Buckley in 7 volumes (London, 1773). After De Thou's death appeared his memoirs, *Thuani Commentarii de Vita Sua* (Orleans, 1620). Consult: Collinson, *Life of Thuanus, with some Account of his Writings* (London, 1807); Chasles, *Discours sur la vie et les ouvrages de J. A. De Thou* (Paris, 1824).

THOUARS, Dupetit-. See Dupetit-Thouars.

THOUGHT. In logic, thought is the intellectual act whereby all knowledge is obtained (see Logic; Knowledge; Judgment; Concept; Inference). In functional psychology the term is used in a narrower sense, to denote the highest or most complex intellectual function, distinguished from sense perception as dealing with general or abstract rather than with concrete objects, and from memory as being constructive rather than purely representative.

The thought consciousness itself resembles in general pattern that of active imagination. Active attention is characteristic of both, and in both the content processes depend not merely upon associative, but also and essentially upon determining tendencies, set into activity by the presence of a particular problem. In imagination, however, the problem is the production of a single, and as yet unrealized object: a machine, a future event, a work of art. In thought, on the other hand, the problem is the relation of some object of thought, taken by the thinker as real, to other objects or to truth. This difference of problem involves first a difference of attitude; in imagination the attitude is that of newness or strangeness, while in thought it is that of validity or consistency. More importantly, it involves further a typical difference in the course of consciousness. Imagination begins with a more or less complete apprehension of the requirements to be met, proceeds by a sort of constructive realization, and ends with an idea which satisfies those requirements. Thought typically begins with the aggregate idea (see Idea), advances by repeated dissections, and ends when the various parts or aspects of the idea have been completely related. These features of similarity and difference have been expressed in the exaggerated statement that imagination is thinking in images (typically concrete), and thought is imagining in words (typically abstract).

The fact appears to be that, although thought may originally have implied the presence of language (q.v.), and still is carried on to a large extent in words, it may now go on in other terms as well. Even in the early experimental investigations of thought, it became evident that any idea, and not merely verbal ideas, might carry the meaning of generality or of abstractness. Under suitable determination, e.g., the abstract meaning of triangle may be represented by the visual image of an equilateral triangle, or by a flicker of kinæsthesis accompanying eye movement towards a board on which triangles have recently been drawn, just as well as by the word "triangle" itself. Furthermore, observers frequently reported yet other processes which seemed not to belong definitely to any previously recognized class of mental formations. They found, e.g., doubts, assurances, beliefs, expectations, consciousness of such-and-such matters, thoughts about this or that,—conscious contents which represented as if in a nutshell wide ranges of meaning and knowledge. These contents they were unable, under the complex and poorly controlled conditions of experimentation, to reduce to familiar elements; they merely indicated and named them. To such formations the name of "conscious attitudes" (*Bewusstseinslagen*) was given. Later experiments, under conditions more favorable for analysis, have demonstrated the complex character of many conscious attitudes, and have shown that they can be reduced to sensation, image, and affection. In particular, the use of the genetic method reveals the attitudes as condensations of sensation and image, often affectively toned, and shows that they take shape partly under the laws of repeated impression (association), and partly under those of selective attention (determination).

The thought idea (abstract idea, general idea, conscious attitude) may further be replaced, in accordance with the general laws of meaning and abstraction (q.v.), by purely physiological processes. The classical example of such a case is that of knowing perfectly well what we intend to say without the least representation of the coming sentence in any sort of imagery. If we here refuse to regard the nervous set or disposition as the vehicle of logical meaning, we must have recourse to a novel type of mental content, a thought element whose essence is to point beyond itself and whose nature (aside from this indication of function) is not describable. Many psychologists at the present time hold, in fact, to some form of the doctrine of imageless thought, and maintain that consciousness is made up of functional acts as well as of content processes. The point of view from which such a belief derives has been set forth under MIND (q.v.).

Consult: A. Messer, *Empfindung und Denken* (Leipzig, 1908); E. B. Titchener, *Experimental Psychology of the Thought-Processes* (New York, 1909); W. B. Pillsbury, *Psychology of Reasoning* (ib., 1910); A. Messer, *Psychologie* (Stuttgart, 1914); R. M. Ogden, *Introduction to General Psychology* (New York, 1914).

THOUSAND AND ONE DAYS. An imitation of the *Thousand Nights and One Night*, or *Arabian Nights* (q.v.), written by Pétis de la Croix, a French Orientalist and traveler, in 1710.

THOUSAND AND ONE NIGHTS. See ARABIAN NIGHTS.

THOUSAND ISLANDS, THE. A collection of small islands, numbering about 1700, situated in an expansion of the St. Lawrence River, about 40 miles long and from 4 to 7 miles wide, between Ontario, Canada, and Jefferson and St. Lawrence counties, New York (Map: Ontario, J 5). They are favorite resorts for summer tourists on account of their picturesque beauty. Many are private property and contain the summer homes of wealthy Americans and Canadians.

THOUSAND LEGS. See MYRIAPODA.

THOYRAS, PAUL DE RAPIN DE. See RAPIN DE THOYRAS, PAUL DE.

THRACE, thrās (Lat. *Thracia*, from Gk. *Θράκη*, *Thrakē*, Thrace, from *Θρᾷξ*, *Thrax*, Thracian). The ancient name of an extensive region in the eastern part of the Balkan Peninsula, whose boundaries varied at different periods. At first the designation seems to have included part of Macedonia, where early story knows of Thracians in Pieria, with whom was connected the worship of the Muses, mythical bards, and Dionysus. Later the name was applied to the great district northeast of Macedonia, with the Danube on the north, on the east the Euxine, on the south the Bosporus, Propontis (Sea of Marmora), Hellespont, the Ægean, and Macedonia, and on the west Illyria and Macedonia. Under the Romans it designated the region south of the Hæmus Mountains (Balkans), the region to the north being the Province of Mœsia. This part of Thrace belongs mostly to Servia. (See SERVIA, *History*.) From the Hæmus three lesser chains stretch south. The three most important rivers of Thrace were the Strymon (mod. *Struma*), which during the Greek period formed the boundary between Thrace and Macedonia; the Nestus (mod. *Kara-Su*); and the Hebrus (mod. *Maritsa*, q.v.), the largest—all flowing southward into the Ægean Sea. The climate was considered by the Greeks very severe—even that of Ænos, on the shores of the Ægean, was described by Athenæus as eight months of cold and four months of winter. The country was largely uncultivated and covered with forests, but the river valleys were fertile. The chief products were grain, millet, wine, and hemp. Cattle, sheep, horses, and swine were raised in great numbers. The minerals were a vast source of wealth, the rich gold mines of Mount Pangæus attracting the Thasians, and leading the Athenians to the foundation of Amphipolis.

While the exact relation between Thracians and Greeks is still uncertain, it is clear that the former belonged to the great Indo-European family, and were probably closely akin to the Phrygians of Asia Minor, whose language indicates some connection in the past with the Hellenic people. In historic times the Thracians appear as a wild and barbarous race, fond of war, ruled over by many petty kings. In the sixth century B.C. they were subdued by the Persians, but after the retreat of Xerxes resumed independence, of which they had probably been only nominally deprived by their conquerors. In the fifth century a King, Teres, seems to have secured a decided supremacy, and under his rule and that of his son Sitalces, with whom the Athenians contracted an alliance, it is possible to speak of a Thracian kingdom. After the death of Sitalces his territory was divided into three parts, and internecine strife was resumed. Thrace thus fell an easy prey to Philip of Macedon (after 359 B.C.), who incorporated the western portion of the country, as far as the Nestus, in Macedonia, while Macedonian garrisons held the rest of the country. After the fall of Macedon before the power of Rome (168 B.C.) Thrace was for a short time independent, but in 133 B.C. it came under the Roman rule. Mœsia was formed into a province in 29 B.C., but Thrace continued under dependent kings until 46 A.D., when it was organized as a province. After the division of the Roman Empire (395) it shared the history of the Eastern Empire. The natural resources of the country and the opportunities for profitable trade early led to the establishment of Greek colonies along the coast. The first were naturally along the waters flowing to the Black Sea, among them Byzantium, Selymbria, Perinthus, Sestus, and Elæus. Before the end of the sixth century B.C. Miltiades had secured the Thracian Chersonese (the modern Peninsula of Gallipoli) for Athens. Along the Ægean coast were Amphipolis, Abdera, Mesembria, Ænus, and many others, while on the Black Sea were Istrus, Tomi, Odessus, and Apollonia. These colonies, however, never attempted to control the interior, and, though they submitted to the Persians, and later to the Macedonians and Romans, their history belongs to Greece rather than to Thrace. In 334 A.D. a colony of Sarmatians was planted in Thrace by Constantine, and in 376 another of Goths by permission of Valens. In 395 it was overrun by Alaric and in 447 by Attila. Soon after the middle of the fourteenth century Sultan Amurath I obtained possession of all its fortresses, except Constantinople. After the fall of Constantinople in 1453 all of Thrace came under the control of the Turks. As a result of the Russo-Turkish War (1878) the northern part of Thrace was set up as a separate administrative district (Eastern Rumelia). The Conference of London in 1913, which closed the Balkan Wars (q.v.), gave this province outright to Bulgaria. Consult: Hiller von Gaertringen, *De Græcorum Fabulis ad Thraces Pertinentibus* (Göttingen, 1886); Tomaschek, *Die alten Thraker* (Vienna, 1893–95); Kalopathakes, *De Thracia, Provincia Romana* (Berlin, 1894); W. Ridgway, *The Early Age of Greece*, vol. i (Cambridge, 1902); and the article "Thrakien" in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914). See BALKAN PENINSULA; BULGARIA.

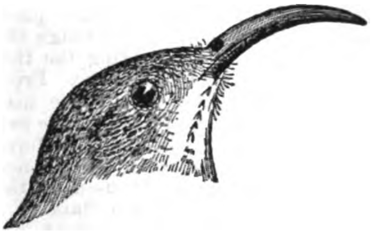
THRACES. The name given by the Romans to a kind of gladiator (q.v.).

THRA'CIAN SA'MOS. See SAMOTHRACE.

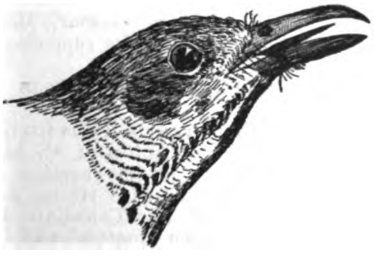
THRALE, thrāl, HESTER LYNCH. An English author. See PIOZZI.

THRA'SEA PÆ'TUS (PUBLIUS CLODIUS THRASEA PÆTUS) (c.20–66 A.D.). A Roman of Nero's time, famous as a Stoic philosopher. He was born at Patavium (Padua). As Stoic he took as his model Cato the Younger (q.v.). He married Arria the Younger (see ARRIA, at the end), and gave his daughter in marriage to Helvidius Priscus (q.v.). His independence and boldness of speech won the hatred of Nero, and the Senate, at Nero's command, condemned him to death. Consult Pliny, *Epistles*, iii, 6, with the notes in the edition of that book by J. E. B. Mayor (London, 1880), and Tacitus, *Annales*, xvi, 21–35.

THRASH'ER (variant of *thrusher*, from thrush). A name given in the United States to the various species of thrushlike wrens of the genus *Harporhynchus* or *Toxostoma*. They have generally a rather long decurved bill, not notched near the tip; short concave wings, much shorter than the tail. In color they are brown or ash above, usually spotted on the breast. Their names are brown thrasher (*Toxostoma rufum*); Cape San Lucas thrasher (*T. cinereum*); gray curve-bill thrasher (*T. curvirostre*); California thrasher (*T. redivivum*); crissal thrasher (*T. crissale*); and Arizona or Bendire's thrasher (*T. bendirei*); besides which there are several subspecies. Only the brown thrasher is widely distributed; all the others are confined to the southwestern United States, especially Arizona and Mexico. The brown thrasher, often improperly called brown thrush, is common in the eastern United States, ranging north to Canada and west to the Rockies. It is migratory in the north, but winters in the Southern States. It is about a foot long, rich ferruginous above, creamy, spotted with brown beneath. It is one of the finest songsters native to America and is also a very fine mimic, thus resembling the mocking bird, to which it is nearly related. Its nest is placed in a low bush or on a brush heap, and the eggs are profusely peppered with brown specks. The brown thrasher, although a vegetarian in part, still is to be considered as a beneficial bird because of the numerous grasshoppers, caterpillars, and bugs destroyed by it. While it does destroy some young grain and fruit it more than makes up for this in the destruction of cutworms and cankerworms, larvæ very injurious to crops. See Plate of EGGS OF AMERICAN SONG BIRDS. Consult Coues, *Birds of the Colorado Valley* (Washington, 1878), and E. H. Forbush, *Useful Birds and their Protection*, published by the Massachusetts State Board of Agriculture (Boston, 1913).



HEAD OF CRISSAL THRASHER.



BROWN THRASHER.

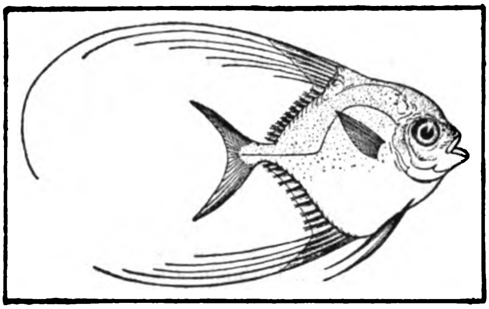
THRAS'YBU'LUS (Lat., from Gk. Θρασύβουλος, *Thrasyboulos*) (?–390 B.C.). An Athenian general and a prominent member of the democratic party at Athens during the last years of the Peloponnesian War. In company with Thrasyllus at Samos, in 411, he vigorously opposed the establishment of the Four Hundred, and helped secure the recall of Alcibiades from exile. In the same year he, with Thrasyllus, defeated the Peloponnesian admiral Mindarus at Cynossema, and in 407, in command of a fleet of 30 vessels, he compelled the submission of the revolted cities in Thrace. He held a subordinate command in the battle of Arginusæ (406 B.C.), and afterward concurred with Theramenes (q.v.) in the accusation of the generals therein engaged. Being banished (404) by the Thirty Tyrants (q.v.), he went to Thebes, where he planned the overthrow of the Thirty and the reëstablishment of the democracy. With 100 men, refugees also, he seized the deserted fort of Phyle, and, joined by others, advanced on the Piræus. In the ensuing battle the Thirty were worsted, and, as a result, the democratic form of government was soon reëstablished at Athens. In 395 Thrasybulus commanded a force sent to assist Thebes against the Spartans. In 391 he was dispatched, in command of 40 triremes, to the assistance of Rhodes, but, first sailing to the Hellespont, succeeded in extending the alliances of Athens in those regions. When the fleet of Thrasybulus reached Pamphylia he was slain by night in his tent by the people of Aspendus, in consequence of some of his soldiers' misdeeds.

THRASYL'LUS (Lat., from Gk. Θράσυλλος), MONUMENT OF. A choragic monument at Athens erected in 320 B.C., by Thrasyllus, in a cave above the Theatre of Dionysus. An ornamental architectural front closed the cave and was surmounted by a statue of Dionysus, now in the British Museum. The monument is in ruins, except an inscribed architrave, and two columns for votive tripods, on the rock face above the cave.

THREAD. A twisted filament of two or more strands of some such substance as cotton, silk, or wool, spun out to a considerable length, and suitable for sewing. See SPINNING.

THREADFIN. See BARBUDO; MANGO FISH.

THREADFISH, COBBLER FISH, or SUNFISH. A well-known fish (*Alectis ciliaris*) allied to the pompanos, of both coasts of tropical America, where it has some commercial importance. It is of moderate size, has the curious shape shown in the illustration, and owes its names to the long filaments (becoming shorter with age) into which the first few rays of the dorsal and anal fins are prolonged.



THREADFISH.

THREAD HERRING, or Machuelo. A small fish (*Opisthonema oglinum*), closely related to sardines and menhaden, common along the southern coast; it is 12 inches long, bluish above and silvery below, with an indistinct bluish shoulder spot, and has a long dorsal-fin filament, from which the fish receives its name.

THREAD'NEE'DLE STREET. A London street, on which stands the Bank of England, hence popularly called the Old Lady of Threadneedle Street. The origin of the name is said to be the three needles as the escutcheon of the Needlemakers' Company.

THREADWORMS. The threadworms or roundworms, so called from their slender round threadlike body, are members of the class Nematelminthes, order Nematoidea. The dense skin is not segmented, and the body cavity (cœlome) is not lined with epithelium, but is directly bounded by the muscles of the body. There is a definite digestive canal. Two excretory canals open in front on the ventral side of the body, while the nervous system consists of a ring around the pharynx, from which two main nerve cords pass backward. The true threadworms undergo no metamorphosis. They are mostly parasitic and usually bisexual. Some are free, living coiled up under stones between tide marks; certain minute species occur in fresh water or damp earth. A few live in plants, and *Tylencha tritici* damages wheat. The more common parasitic forms are species of *Ascaris*, *Trichina*, *Oxyuris*, etc. Of *Ascaris*, the human roundworm (*Ascaris lumbricoides*) is remarkable for its great size, being 5–6 inches long, and about $\frac{1}{16}$ of an inch in diameter; it has three papillæ around the mouth and is milk white. The common pinworm (*Oxyuris vermicularis*) lives in the rectum of children; the palisade worm (*Eustrongylus gigas*), one female of which was 39 inches in length and the thickness of a quill, the male being one-third as long, has been found living in man; allied species occur in the brain or brain cavity of birds. Among the most formidable human parasites of this group are the Trichina (q.v.), the guinea worm (q.v.), and the species of *Filaria*. *Filaria sanguinis hominis*, a microscopic threadworm found living in the blood of the mosquito in India and China, is thought to occasion the disease known as elephantiasis. The formidable disease *beriberi* is supposed to be due to a nematode worm, whose eggs and embryos swarm by millions in soil and puddles near villages. In certain species of the family Anguillulidæ there is an alternation of generations (see Parthenogenesis), from an hermaphroditic internal parasitic to a free diœcious generation. Thus *Rhabditis* (*Rhabdonema*) *nigrovenosa* lives in mud, and gives rise to a second form living in the lungs of frogs.

THREATS. See Blackmail; Conspiracy; False Imprisonment; Intimidation; and consult the authorities referred to under Conspiracy and Criminal Law.

THREE CHAPTER CONTROVERSY. See Chapters, The Three.

THREE CHOIRS FESTIVAL. An English musical festival which had its first regular organization in 1724, when the three cathedral choirs of Gloucester, Worcester, and Hereford joined for the performance of a cathedral service, and an oratorio performance given in the Shire Hall. The proceeds have always been devoted to a fund for the relief of the widows and orphans of the poorer clergy of the three dioceses. In 1753 the festival was extended to three days, and in 1836 to four days, the period which still prevails. The festivals are held alternately in each of the three cities.

THREE-COLOR PROCESS. A photomechanical process of reproducing in color applicable either to stone or metal. The general process consists in first making three photograph negatives of the same subject through three different color screens representing the three primary colors, red, yellow, and blue. From these three negatives printing blocks are made and the result is obtained by making three printings, one from each block, with three different pigments, each pigment representing as nearly as possible the color originally used in the color screen. The accuracy of the finished picture depends, therefore, to a great extent, upon the correctness of the pigments selected. In much of the best modern color work a fourth plate printing in black or gray is employed to give greater depth to the shadows. Reference should also be made to Color Photography, where the underlying principles are explained. The method of making the metal half-tone plates is discussed under Photo-Engraving; while three-color work with stone plates is treated under Lithography.

THREE EMPERORS' LEAGUE. See Triple Alliance.

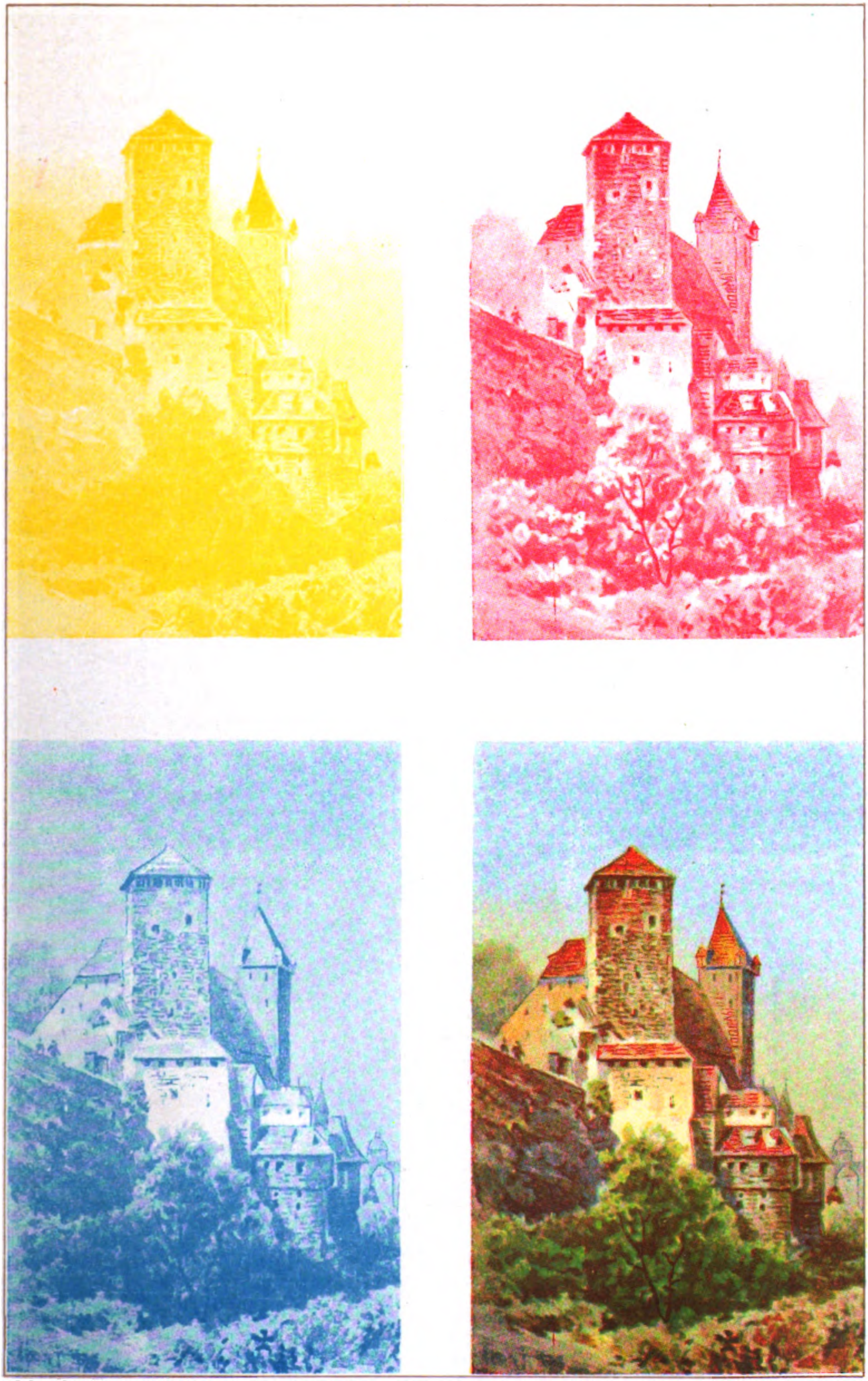
THREE IMPOSTORS, The. See Impostors, The Three.

THREE KINGS OF COLOGNE. The three wise men of the East or Magi who followed the star to the birthplace of the infant Jesus. Their names are usually given as Gaspar, Melchior, and Balthazar. Their bones are supposed to be preserved in Cologne cathedral.

THREE MUSKETEERS. See Trois Mousquetaires.

THREE RIVERS (correctly, Trois Rivières). A port of entry and the capital of St. Maurice County, Quebec, Canada, at the junction of the St. Lawrence and St. Maurice rivers, and on the Grand Trunk and the Canadian Pacific railroads, midway between Montreal and Quebec (Map: Quebec, H 5). It was founded in 1634 by Laviolette, who was sent by Champlain, and is 23 miles from the famous falls of Shawinigan. It has a Roman Catholic cathedral, a convent, a classical college, a commercial academy, and various manufactures. Here on June 8, 1776, an American force of about 2000 men under General Thompson attacked a British force of about 6000 men, and was disastrously defeated. Pop., 1901, 9981; 1911, 13,691.

THREE COLOR PROCESS



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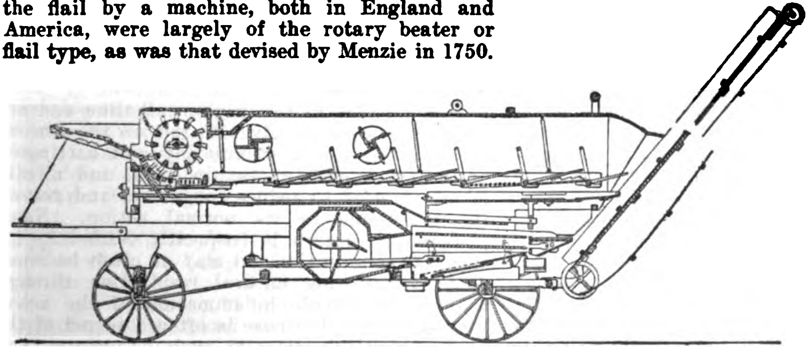
THREE RIVERS. A city in St. Joseph Co., Mich., 25 miles south of Kalamazoo, on the Michigan Central and the New York Central railroads (Map: Michigan, D 7). It is situated at the junction of the St. Joseph, Portage, and Rocky rivers. The leading manufactures are cars, railroad supplies, marine engines, leather, robes, knit goods, paper, tools, brass, and foundry and machine-shop products. It maintains a Carnegie library. Pop., 1900, 3550; 1910, 5072.

THRESHER SHARK, Fox Shark, or Swingletail. A peculiar shark (*Alopias vulpes*) abounding in all warm seas, especially in the Mediterranean and the Atlantic, and distinguished by its long tail. (See Plate of Great Sharks under Shark.) This is an extension of the upper lobe of the heterocercal tail to a length equal to or exceeding that of the body, and is used in obtaining the food. This shark feeds on schools of herring, menhaden, etc., rushing into them, and threshing about with its tail. It is about 15 feet long, lead color above, whitish beneath.

THRESHING (from *thresh*, AS. *þerscan*, OHG. *drescan*, Ger. *dreschen*, to thresh) and Threshing Machines. Threshing is the separating of the grain or seeds of plants from the straw or haulm. This has been accomplished in various ages and countries by differing means, more or less effective. The first method known was the beating out of the grain from the ears with a stick. An improvement on this was the practice of the ancients of spreading the loosened sheaves of grain on a circular piece of hard ground and driving oxen or other animals over it, so as to tread the grain out; but as this was found to damage some of the grain, it was partially superseded in later times by the threshing sledge, a heavy frame mounted on three rollers, or having pieces of iron or sharp flints fastened to the lower side, in place of rollers. The threshing sledge is still to be seen in operation in Greece, Asia Minor, Georgia, and Syria. The primitive implement in northern Europe was the stick, and an improved modification of it, the flail, which consists of two sticks loosely fastened together by stout thongs, is still sometimes used in Europe and America.

Early but unsuccessful inventions to supersede the flail by a machine, both in England and America, were largely of the rotary beater or flail type, as was that devised by Menzie in 1750. In 1786, however, Andrew Meikle, an ingenious Scotch mechanic, produced a threshing machine so perfect that, despite nearly a century of improvers, it is essentially the machine of its inventor and embodies many of the essential features of the improved modern machine.


LONGITUDINAL SECTION OF MODERN THRESHER.

Meikle's drum with two grooved cylinders have, however, been almost entirely superseded in modern machines by a high-speed cylinder with radial teeth playing between inwardly projecting teeth set in a fixed concave or section of a cylinder. With the exception of the endless apron machine patented by the Pitt Brothers of Winthrop, Me., in 1837, little progress was made in perfecting the threshing machine in America prior to 1840. Since that date improvement has been rapid, and the modern American machine with a capacity of 1000 bushels per day is a marvel of ingenuity and efficiency. The first machine merely threshed the grain. In its most advanced form the modern machine cuts the bands of the sheaves and feeds itself; thoroughly separates the grain from the straw; winnows and weighs the grain and deposits it in sacks or loads it into wagons; removes the straw and stacks it. The figure shows the principal features of the interior construction of a simpler form of modern thresher. The concave is open and has in rear an open grate so that the larger part of the grain is separated from the straw at this point and is conveyed directly to the fan. A considerable portion, however, still remains in the straw and can be separated only by further agitation, which is secured by the vibrating separator, revolving pickers or beaters, and shaking forks shown in the centre of the machine to the rear of the cylinder. These devices beat the straw thoroughly while conveying it to the rear of the machine, where it is taken by the stacker, which consists either of an elevator or tube with blast. The separated grain drops through the perforated bottom of the separator and with the grain coming directly from the drum is carried to the fanning mill by means of a vibrating platform or conveyor located immediately beneath the separator. The parts of the modern thresher are in large measure adjustable, so that it may be adapted to different kinds of grain and to a variety of conditions, but separate machines for special purposes are also made, as, e.g., for threshing rice, peas and beans, peanuts, clover, and for husking maize and shredding the fodder. Pea and bean threshers usually have two cylinders running at different rates of speed. Clover hullers have an additional hulling cylinder. Inventive genius is also being exercised in devising ingenious accessories to the thresher proper—automatic band cutters and feeders, stackers, and grain measurers and loaders.

The motive force is horse power or steam. The former (treads and sweeps) was most common in the earlier days, but has been largely superseded by the portable steam engine and the internal combustion engine. Engines with straw-burning furnaces have been used in Hungary and in the rice regions of the United States.

Thresher fires are of frequent occurrence, often due, as the Washington Agricultural Expert Station has shown (*Bulletin 117*), to ignition and explosion of dust by static electricity generated by the cylinder. The danger is especially great in very dry seasons and with a large amount of smut and organic dust from broken grain and straw. One of the preventives suggested is to ground the cylinder. Consult: G. F. Conner, *Science of Threshing* (St. Joseph, Mich., 1906); Davidson and Chase, *Farm Machinery and Farm Motors* (New York, 1908); G. F. Conner, "Using the Modern Grain Separator," in *Power Farming* (Chicago, January, 1916).

THRIFT (Icel. *þrift*, from *þrífa*, to thrive, clutch, grip; so called from the rapid growth of the plant), *Armeria.* A genus of plants of the family Plumbaginaceæ, having the flowers collected into a rounded head. By many botanists it has been regarded as a subdivision of the genus *Statice*, from which it is distinguished chiefly by having the flowers in heads. The common thrift (*Armeria maritima*) is a European seacoast plant which grows in turflike form, with linear leaves, scapes a few inches high, and beautiful rose-colored flowers in midsummer. Being hardy and easily cultivated, it is often planted in gardens as a border, but it must be renewed every two or three years; the smallest roots grow, however, with great readiness in the moist weather of spring. A number of other species, i.e., *Armeria elongata*, *Armeria plantaginea*, are planted as ornamentals.

THRIPS (Lat., from Gk. *θρίψ*, woodworm). Any one of the minute insects of the order Thysanoptera. They are slender insects with four wings, which are also very slender and short, perfectly transparent, and without veins. The wings are fringed with long, delicate hairs, and when at rest lie along the back of the abdomen. The metamorphosis is incomplete, and the mouth parts function in sucking, but are intermediate between true biting and true sucking mouth parts. The feet bear each a little bladder-like vesicle at the tip, from which an old name of the order (Physapoda) was derived. Thrips are found in flowers, and do some damage to the essential organs. They also occur upon the leaves of plants, and one species damages onions (see ONION INSECTS) and tobacco. Another species (*Limothrips poaphagus*) works in the joints of timothy grass, causing the heads prematurely to turn yellow and die. Some species have been observed feeding upon other insects and others undoubtedly have some beneficial effect as pollinators of flowers. Parthenogenesis sometimes occurs with these insects. Rather more than 30 species occur in the United States. The name "thrips" has been erroneously applied by vine growers to some of the leaf hoppers of the family Jassidæ. Consult Hinds, *Contribution to a Monograph of the Insects of the Order Thysanoptera Inhabiting North America* (Washington, 1902). See LEAF HOPPER.

THROAT (AS. *þrotu*, OHG. *drozza*, Ger. *Drossel*, throat; connected with MHG. *strozze*, throat, Ger. *strotzen*, to swell, Eng. *strut*), AFFECTIONS OF THE. The throat includes those structures lying behind and below the anterior pillars of the fauces. In common acceptation, it also means the anterior portion of the neck, containing the windpipe, gullet, and a number of large blood vessels and nerves. The throat may be divided anatomically into the pharynx and the larynx, the latter being the upper part of the windpipe and the principal organ of the voice. The nasal passages and the Eustachian tubes open into the pharynx, and its entrance is nearly surrounded by a ring of lymphoid tissue, comprising the faucial, lingual, and pharyngeal tonsils. The first of these (usually called the tonsils) are always present, and often enlarged, and are situated at the sides of the fauces between the anterior and posterior pillars. The lingual tonsil, when it exists, lies at the base of the tongue, in front of the epiglottis. The pharyngeal tonsils, more often called adenoid growths, spring from the roof and sides of the pharyngeal vault. They are often present in children and when in any amount constitute a pathological condition, giving rise to obstructed nasal breathing, nasal catarrh, and general poor health. Any or all of these structures may be involved in diseases of the throat, and expert examination of them is often necessary. Inspection is usually conducted by light reflected into the throat from a head mirror, a circular, concave reflector pierced with a hole for vision. The light is projected through the open mouth upon the back of the throat. From this point the rays of light may be reflected by means of a small mirror introduced into the pharynx either downward to examine the larynx (laryngoscopy) or upward to inspect the posterior nares and the vault of the pharynx (rhinoscopy), the tongue being meanwhile held out or depressed. In direct examination the tonsils, soft palate, uvula, posterior wall of the pharynx, and often the top of the epiglottis may be seen. Laryngoscopy shows the whole of the epiglottis, the root of the tongue, lingual tonsil, the true and false vocal cords, the opening of the glottis, and even the bifurcation of the trachea. The throat is lined with mucous membrane, plentifully supplied with blood vessels, glands, and nerves, and is often the seat of acute or chronic catarrhal inflammation. Acute or chronic inflammation of either the pharynx or larynx may be due to exposure, sudden change of temperature, the inhalation of dust, steam, or irritating vapors, indigestion and constipation, and certain diseases such as rheumatism, gout, and tuberculosis. Specific inflammations of the throat accompanying scarlatina and diphtheria are described under these titles. Catarrhal inflammation of the throat is marked by a sense of dryness, or of a foreign body in the pharynx, a slight but annoying cough, and the expectoration of viscid, tenacious mucus, sometimes tinged with blood. The voice is hoarse, easily fatigued, or entirely absent. In the treatment of catarrhal conditions in this region, alkaline and antiseptic douches are given to remove the mucous accumulations, and stimulating and astringent applications, such as tannin, iron, and nitrate of silver, used to reduce congestion and restore the membrane to its normal action. Nasopharyngeal catarrh is frequently caused by intranasal abnormities and may as often be remedied by restoring normal respiration through the nose. Chronic inflammation of the accessory sinuses of the nose is often a sequel of the acute infectious diseases such as grippe, and tends to keep up a chronic nasal discharge. General tonic treatment is always necessary. Internally iron, quinine, and strychnine are the best remedies.

Abscesses sometimes occur in the throat either in the region of the tonsils (see QUINSY) or at the base of the tongue. An acute and alarming inflammation of the loose tissues about the larynx is found in connection with abscess, acute laryngitis, the injecting of scalding fluids or irritant poisons, and as a complication of certain diseases such as smallpox, scarlatina, or Bright's disease. In this condition, known as œdema of the glottis, the swollen and dropsical tissues fill up or overlap the opening of the glottis, preventing the ingress of air and threatening immediate suffocation. If not speedily relieved, œdema of the glottis causes death by asphyxiation. This affection is treated by puncture or scarification of the dropsical sac, the application of leeches over the sides of the larynx, and the administration of pilocarpine. Sometimes intubation, laryngotomy, or tracheotomy may be necessary. Intubation consists in the introduction of a metal or hard-rubber tube between the vocal cords, with a flange resting above them to prevent slipping into the trachea. Laryngotomy or tracheotomy is employed when intubation is not feasible. The former consists in opening the larynx from the outside through the cricothyroid membrane, and introducing a tube through which the patient breathes. In tracheotomy the opening is made lower down, in the trachea.

Tuberculous laryngitis occurs in many phthisical patients. There is swelling, ulceration, and destruction of the vocal cords and adjacent structures, with hoarseness, loss of voice, great pain, and inability to swallow solid food. Syphilis, particularly in its tertiary stage, often attacks the throat, producing fibrous tissue which gradually contracts, and narrows, distorts, and partially destroys the larynx. Foreign bodies sometimes find their way into the larynx, and if small may pass into the trachea or bronchial tubes, and failing removal may produce death by suffocation or set up a fatal pneumonia. In children it is often possible by inverting and shaking the patient to dislodge a foreign body; in other cases these have to be removed by specially devised instruments or a cutting operation. A long, electrically lighted metal tube called a bronchoscope is now generally employed for the purpose. Cancer and other tumors of a polypoid or fibrous character may develop in the larynx or its neighborhood. Cancer is nearly always fatal. Consult: J. W. Downie, *Clinical Manual for Study of Diseases of the Throat* (2d ed., New York, 1906); W. L. Ballenger, *Diseases of the Nose, Throat, and Ear: Medical and Surgical* (4th ed., Philadelphia, 1914); D. B. Kyle, *Textbook of Diseases of the Nose and Throat* (5th ed., ib., 1914); H. W. Loeb and others, *Operative Surgery of the Nose, Throat, and Ear* (2 vols., St. Louis, 1914–15); B. C. Giles, *Nose, Throat, and Ear: Their Functions and Diseases* (Philadelphia, 1915). See Adenoid, Adenoids; Catarrh; Diphtheria; Laryngitis; Quinsy; Tonsil.

THROMBO'SIS (Neo-Lat., from Gk. *θρόμβωσις*, the state of being curdled, from *θρόμβος*, *thrombos*, curd, clot). A term originally suggested by Virchow, and employed to designate an affection of the blood vessels (either veins or arteries) which essentially consists in a coagulation of blood (forming a true clot) at a certain fixed spot, owing to disease of the blood vessel, pressure against its side or laceration of it, or microbial infection. It is a common cause of sudden death in persons who appear to be in robust health. If death does not result, after the detachment of a thrombus and its lodgment, as an embolism, in a cerebral artery, softening of the brain follows. See Apoplexy; Embolism.

THROM'BUS. A stratified clot formed within a blood vessel by coagulation at a bifurcation of a vessel or upon a surface roughened, e.g., by inflammatory or sclerotic changes. See Thrombosis.

THRONDHJEM. See Trondhjem.

THROOP. A borough in Lackawanna Co., Pa., adjoining Scranton, on the New York, Ontario, and Western and the Delaware, Lackawanna, and Western railroads. There are productive coal mines and a silk mill. Pop., 1900, 2204; 1910, 5133.

THROOP, Montgomery Hunt (1827–92). An American lawyer, nephew of Enos T. Throop, Governor of New York. He was born at Auburn, N. Y., was educated at Hobart College and abroad, was admitted to the New York bar in 1848, and practiced in partnership with Roscoe Conkling. In 1870 he was appointed a commissioner to revise the statutes of the State; afterward was chairman of the commission that prepared the Code of Civil Procedure, and after 1878 devoted himself to legal writing. His publications include a *Treatise on the Validity of Verbal Agreements* (1870); an *Annotated Code of Civil Procedure* (1880); and the *Revised Statutes of New York* (1888).

THROSTLE. See Spinning.

THROW (AS. *þrāwan*, OHG. *drāhan*, *drājan*, Ger. *drehen*, to turn, twist). The term applied in mining to the amount of dislocation (q.v.), in a vertical direction, produced by a fault in the strata. That side of the fracture which has moved downward relatively is spoken of as the downthrow side, the opposite one as the upthrow. See Fault.

THRUSH (AS. *þrysce*, OHG. *drōscela*, Bav. *Droschel*, thrush; connected with AS. *þrostle*, *þrosle*, Eng. *throstle*, Ger. *Drossel*, thrush). The thrushes comprise the subfamily Turdinæ of the family Turdidæ, usually ranked as the highest group of birds. They have a bill of moderate size, straight, shorter than the head, and provided at the base with rictal bristles; the nostrils are oval and bare; the tarsi are long, slender, and booted; ten primaries are present, but the outermost is exceedingly small; tail shorter than wings. About 150 species, all of moderate size, are known, and they are widely distributed, and most of them are migratory. A few species are gregarious, but the majority live singly or in pairs. Their food is mainly adult insects and caterpillars, of which they destroy incalculable numbers, but in winter they eat berries and seeds, and in spring small fruits. Thrushes are to be considered as birds of economic value both because of their destruction of many insect pests, such as the forest tent caterpillar and the gypsy moth, and also because certain of the thrushes aid in reforesting burnt areas through eating stone fruits, as cherries. All are excellent singers, and some are counted the best of bird songsters.

In America, north of Mexico, there are about a dozen species of thrush, of which the best known is the common robin (q.v.), which ranges over the whole continent. In Lower California there is an allied species; and in the Northwest occurs the varied thrush. (See Oregon Robin.) The more distinctive thrushes are considerably smaller than the robin, and all of them are birds of the woods. They belong to the genus *Hylocichla*, formerly included in *Turdus*.

The best known are the Wilson's thrush or veery (*H. fuscescens*), the song or wood thrush (*H. mustelina*), the olive-backed thrush (*H. ustulata*), and the hermit thrush (*H. guttata*), the two latter being divided into a number of subspecies. All these are seven or eight inches long, olive or brown above, white, more or less creamy, and spotted below. The wood thrush or wood robin is a less retiring bird, not infrequently seen on lawns and in orchards. He is larger than the veery, with the head bright cinnamon brown, changing gradually into light olive brown towards the tail. Moreover, he is thickly marked with large round black spots underneath. The song of this thrush, especially as evening approaches, is remarkably sweet and has made him a great favorite with bird lovers. The ordinary calling note has been likened to striking pebbles together; it is utterly unlike the clear whistle of the veery. The nest is usually in a bush or on a tree limb or a stump, five or ten feet from the ground, and is distinctively characterized by always having a foundation of dead leaves, often with some mud. The eggs are clear blue. The olive-backed thrush is a more northerly species than either of the preceding, and occurs in the United States chiefly as a migrant, while it winters in the tropics. It is readily distinguished by the uniform olive upper parts, and the bright buff lores and rings around the eyes. The only species with which it is at all likely to be confused is the gray-cheeked thrush (*H. aliciæ*), a bird of similar range and habits, without the buff lores and eye rings, and formerly regarded only as a variety. The eggs of both are blue, spotted and speckled with bright brown. The hermit thrush may be easily recognized by the fact that the tail is rufous, brighter than the back. It is also a somewhat smaller and more slender bird than either the veery or wood thrush. It is distributed over the whole of North America, but breeds mainly north of the United States. There are several subspecies recognized by names, as in the preceding species. Owing to priority of description the olive-backed thrush of the East is the subspecies *swainsoni* and the hermit thrush of the same region is the subspecies *pallasi*. The latter is one of the most renowned songsters of America, although, on account of its northern breeding grounds and retiring habits, few persons hear it. While some regard the notes as not essentially superior to those of the wood thrush, most writers on bird music agree that, for purity and sweetness of tone and exquisite modulation, the hermit is unequaled. The nest and eggs are very similar to those of the veery.

The thrushes of the Old World are numerous and well-known birds, of which several are common in Great Britain, as the song thrush or mavis, the mistle thrush, blackbird, ouzel, fieldfare, and redwing (qq.v.).

The name "thrush" is sometimes given to birds of other families, which are exceptional songsters. Thus in the United States the thrasher (q.v.), one of the finest singers of all, is often called brown thrush, although more nearly a wren. On the other hand, various members of the family are known by other names, as the bluebird, robin redbreast, stonechat, and various small Oriental genera.

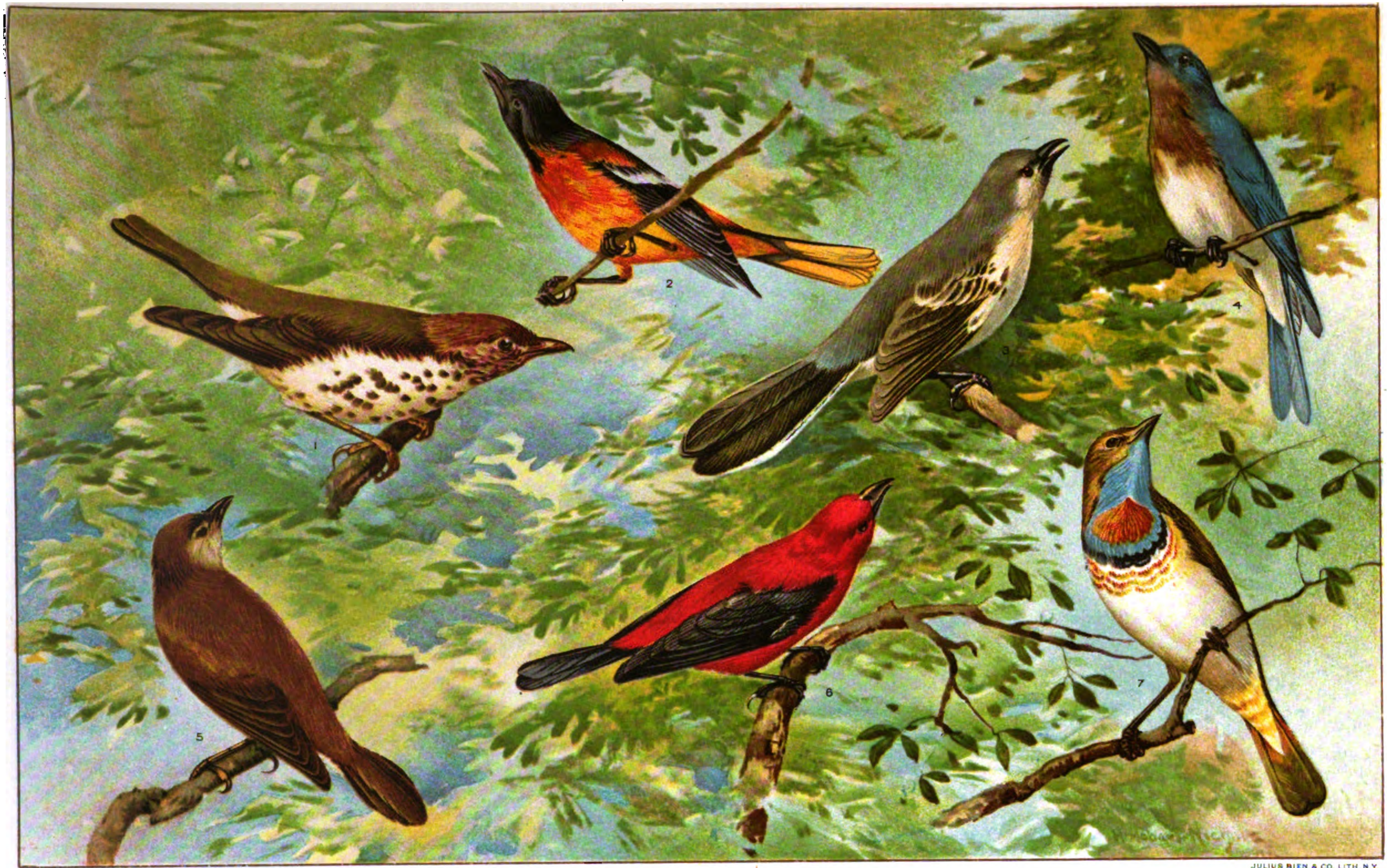
The Turdinæ, characterized by the fact that the young are constantly spotted, although they may become concolorous when adult, is only one of the five subfamilies into which, according to some authors, the great thrush family (Turdidæ) is divided. The other subfamilies are the Myiodectinæ, a small group of brownish flycatcher-like birds; the Sylviinæ, or Old World warblers (see WARBLER); the Polioptilinæ, or gnat catchers and wren tits (qq.v.); and the Miminæ, or American mocking birds, including the incomparable mocking bird of the Southern States. It should be added that some ornithologists object to this widely inclusive use of the family name and confine it to the thrushes proper. Consult authorities cited under BIRD. Consult Forbush, *Useful Birds and their Protection*, Massachusetts Board of Agriculture (Boston, 1913).

THRUSH (dialectic Swed. *trösk*, Swed. *torsk*, tongue thrush). An inflammation and ulceration of the sensitive surfaces within the frog of horses' feet, giving rise to a fetid discharge, constituting unsoundness, and usually causing lameness. Want of cleanliness is the chief cause. The disease is most common in draft horses. The term "thrush" is often applied to foot-and-mouth disease (q.v.). Consult Leonard Pearson and others, *Special Report on Diseases of the Horse*, published by the United States Bureau of Animal Industry (rev. ed., Washington, 1911).

THRUSH; SPRUE; INFANTILE SORE MOUTH. A disease of early infancy, characterized by the presence of small, roundish white specks or patches on the lining membrane of the cavity of the mouth and throat, on the surface of the tongue, the angles of the lips, etc. These patches, which are termed *aphthæ*, look like minute drops of tallow or fragments of curd, and are formed by elevated portions of epithelium covering a drop of serous fluid; and as the dead epithelium falls off, a red, usually raw, surface is exposed. The cause is a fungus, the *Oidium* (or *Saccharomyces*) *albicans*, which combines with cast-off epithelial cells and with food (milk) to form the spongy, fragile membrane. In thrush crops of these little patches commonly succeed one another. These spots render the mouth hot and tender, and sucking is therefore accompanied by difficulty and pain. The general symptoms are fever, flatulence, colic, and diarrhœa. The stools are green, slimy, and acrid. The disorder usually lasts 8 or 10 days, and is attended with danger only when the local affection becomes gangrenous. Thrush is contagious and is transmitted chiefly by dirty nipples and feeding bottles. The disease rarely appears in healthy individuals, but in those whose vitality has been impaired by the exanthemata, pneumonia, or even slight intestinal disturbances, it may be contracted. Acidity of the saliva, often produced by fermentation of milk curds, or normal in infants, may further the growth of the thrush fungus. The preventive treatment is absolute cleanliness of nursing bottle and nipples and pasteurizing the milk; too vigorous cleansing of the child's mouth is bad. When the disease is established, gentle cleansing of the oral cavity with a solution of borax, boracic acid, or bicarbonate of soda, or potassium permanganate, together with such constitutional treatment as may be needed, is indicated.

THUCYDIDES, thū-sĭd'ĭ-dēz (Lat., from Gk. *Θουκυδίδης*, *Thoukydidēs*) (?–c.399 B.C.). A famous Greek historian, son of Olorus and Hegesipyle, born in the Attic deme Halimus. The date of his birth is unknown, but was certainly not earlier than 470 B.C. nor later than

REPRESENTATIVE SONG BIRDS



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1 WOOD THRUSH - TURDUS MUSTELINUS
2 BALTIMORE ORIOLE - ICTERUS GALBULA
3 MOCKING BIRD - MIMUS POLYGLOTTOS
4 BLUEBIRD - SIALIA SIALIS
5 NIGHTINGALE - DAULIAS LUSCINIA
6 SCARLET TANAGER - PIRANGA ERYTHROMELAS
7 RED-SPOTTED BLUETHROAT - CYANECULA SUECICA

454. Conservative opinion now favors a date near the latter year. By descent he belonged to an ancient aristocratic family on one side, and on the other was connected with a line of Thracian princes. From this Thracian side of his family he possessed gold mines in Thrace (q.v.) opposite the island of Thasos (q.v.). He was well educated; tradition says that he was the pupil of Antiphon and Anaxagoras. In politics he favored the aristocratic party, but his views are all marked by moderation and fairness. When the Peloponnesian War broke out, Thucydides was of an age to enable him to discern the importance of the contest and to form plans for recording its course and result. In 424 he was appointed to command a portion of the fleet off the Thracian coast, and in the same year he failed to arrive in time to relieve Amphipolis (q.v.), which was besieged by Brasidas (q.v.). For this failure he was condemned to death for treason, but left Athens and lived the next 20 years in exile. This period he spent partly on his estates in Thrace and partly without doubt in examination of the scenes of the war in Italy and Sicily. He also resided for a time at the court of King Archelaus (q.v.) in Macedonia. After the restoration of the democracy at Athens in 403, Thucydides was recalled from exile. His history, which covers 21 years of the Peloponnesian War, breaks off in the middle of the year 411. The last book did not receive its final form, but there is no reason to doubt that it comes from his hand. The present division into eight books was made by later grammarians.

Thucydides is now regarded by all as the first critical historian and the greatest historian of antiquity. He brought to his undertaking a practical acquaintance with politics and military science, his natural endowments fitted him to pass impartial judgment on the events that he narrates, and he emphasizes more than once the care with which he endeavored to find out the truth. His materials were obtained in the main by personal observation or by questioning those who had been upon the ground; but for the earlier period he depended upon his predecessors. His purpose being to narrate the war, he clung closely to his subject and made few digressions, so that we have to regret that he has nothing to say of literature, art, or the conditions of the people. But the military movements of the time are portrayed with a vividness which has never been equaled. In form, his history is strictly annalistic, the account being given by summers and by winters, so that his work suffers from his failure to group events effectively. His style is the older Attic. His periods are not polished or rounded out, and his effort after brevity often makes his meaning obscure and hard to reach. Yet his style was greatly admired in antiquity, and became the model of many historians in the following centuries (e.g., among the Romans, Sallust and Tacitus). In his characterization of the leaders in the struggle between Athens and Sparta he was most successful, and frequently employs with great skill speeches which he puts into their mouths.

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THUG (Hind. *ṭhag*, a cheat, from Skt. *sthaga*, rascal). The name in northern India of a religious fraternity which committed murders in honor of Kali (q.v.), the wife of Siva (q.v.), and lived chiefly upon the plunder obtained from its victims. In the south of India they used to live under the protection of the native chieftains in consideration of a settled contribution. The Thugs were first generally known about 1800, although they existed as early as 1290. Although at the beginning of the nineteenth century they had become little more than murderers, the original religious character of their deeds survived in many ways, particularly in the bloodless character of their assassination, which points back to an unbloody sacrifice in honor of the female aspect of the destructive power of nature. They really formed a caste, as the profession was in the main hereditary, although a few recruits were admitted from without, and a number of Mohammedans joined the order. When they learned through watchers or spies that persons of property were about to undertake a journey, they either managed to accompany them or to follow them, often for hundreds of miles before a safe opportunity presented itself for accomplishing their purpose. Usually they threw around the neck of the victim a cloth called the *rumal*, or yard of cotton, with a knot in the left end, which one of the gang held at one end, while the other was seized by an accomplice. While these two Thugs drew the noose tight and pressed the head of their victim forward, a third seized him by the leg and thus threw him to the ground. If properly strangled, the sacrifice was dead before he touched the ground. The utmost care was taken to commit the murder in an unfrequented spot, and the body was buried in a place where it was not likely to be found.

Another class of Thugs murdered those in charge of children, whom the assassins then sold into slavery. Castes or classes exempt from the Thugs were washermen, sweepers, musicians, poets, blacksmiths, carpenters, oil venders, cripples, lepers, bearers of the holy Ganges water, and those who had with them a cow. Neither would a true Thug kill a woman. A portion of the plunder was usually set aside for their tutelary deity, and a part was often allotted for the widows and families of deceased Thugs.

Kali was believed to have formerly assisted the Thugs in disposing of the bodies of their victims by devouring them. But through an indiscretion of one of the fraternity, who looked back, she became displeased, and condemned them to bury their victims. But though she refused her assistance, she presented her worshipers with one of her teeth for a pickaxe, a rib for a knife, and the hem of her lower garment for a noose. On the faith of this legend the pickaxe was the instrument especially esteemed by the Thugs and its fabrication was the subject of ceremonials. After every murder the Thugs performed a special solemnity called *tapuni*, which was celebrated in honor of Kali. Another feast observed by the Thugs throughout India was called *Kurhae Karna* or *Kote*, likewise in honor of Kali. The superstitions of the Thugs were of Hindu origin; but they were adopted also by Mohammedan Thugs, who sometimes identified Kali and Fatima.

It was only after 1831 that energetic measures against the Thugs were adopted by the British authorities, and in 1835 almost 400 were hanged and 986 were transported or imprisoned for life. By 1840 they were practically suppressed.

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THUGUT, too͞'goo͞t, Franz Maria, Baron (1736–1818). An Austrian statesman, born at Linz. He was admitted to the Oriental Academy in Vienna in 1752, went to Constantinople in 1754, and became court interpreter at Vienna in 1766. He was appointed diplomatic representative at Constantinople in 1769 and obtained the cession of Bukowina to Austria in 1771. In 1780 he was made Austrian Ambassador at Warsaw and in 1787 at Naples. He negotiated the Peace of Sistova with Turkey in 1790; was made Director General of Foreign Affairs in 1793, in which capacity he continued the anti-Prussian policy of Kaunitz, but sought also to advance Austrian interests at the expense of France. This plunged the country into the disastrous war with revolutionary France, which ended with the Peace of Campo-Formio (q.v.) in 1797. After acting for some time as administrator in the newly acquired Italian provinces, he took up his old post in the ministry. He retired in 1800 and devoted the rest of his life at Pressburg and Vienna to the study of Oriental literature.

THUILLE, too͞-ē'le, Ludwig (1861–1907). A German composer, born at Bozen (Tirol). After receiving his first instruction from his father, an enthusiastic amateur, he was placed in 1877 under Pembaur at Innsbruck. In 1879–81 he attended the Musikschule at Munich, where he studied piano with Bärmann and organ and composition with Rheinberger. In 1883 he was appointed instructor of piano and theory, and in 1890 became professor. He died in Munich. His works comprise a sextet for piano and strings; a piano quintet; a sonata for cello and piano; several choruses for female voices; and the operas *Theuerdank* (1897), *Lobetanz* (1898; in New York, 1911), *Gugeline* (1901). Together with R. Louis he wrote an excellent *Harmonielehre* (1907).

THU'JA. A genus of Conifers including about four species which occur in North America and eastern Asia. The common representative is *Thuja occidentalis* (white cedar or arbor vitæ).

THULE, thū'lē (Lat., from Gk. Θούλη, *Thoulē*). The name generally given by the ancients to the most northerly part of Europe known to them. According to Pliny the Elder it was an island in the northern ocean, discovered by the navigator Pytheas (q.v.), who reached it after six days' sail from the Orcades. Many modern geographers identify Thule with Iceland. Some, however, prefer to seek for it in that part of Norway called *Thile* or *Thilemark*, or in Jutland, the extremity of which is known as *Thy* or *Thyland*. Perhaps Mainland, the principal member of the Shetland group, has the best claim to being regarded as the Thule of Pytheas. The Romans used the phrase *Ultima Thule* to denote the most distant unknown land.

THU'LIUM. A rare chemical element that occurs in the minerals euxenite, samarskite, ytterspar, and others. Its existence was first suspected by Cleve in 1879, but it was first isolated in a probably pure state by Urbain in 1900. The element (symbol Tm; atomic weight 168.5) forms an oxide of the formula Tm_2O_3 and a series of well-defined salts.

THUMANN, too͞'män, Paul (1834–1908). A German illustrator and painter, born in Tschacksdorf, Brandenburg. He studied in Berlin, Dresden, and Weimar, and taught successively in the academies of Weimar, Dresden, and Berlin. He illustrated Chamisso's *Frauenliebe und -Leben* and *Lebenslieder und -Bilder*, Goethe's *Dichtung und Wahrheit*, Heine's *Buch der Lieder*, Tennyson's *Enoch Arden*, *etc.* His paintings include five scenes from the life of Luther (1872–73), in the Wartburg, near Eisenach. His work is characteristically German and his early style possessed much freshness and charm; later it became sentimentalized.

THUMB. See Hand.

THUMB, tụmp, Albert (1865–1914). A German Greek scholar, born at Freiburg. He was educated at Freiberg, Heidelberg, Leipzig, and Berlin. In 1890–92 and again in 1894 and 1912 he journeyed and studied in Greece. From 1895 to 1901 he was professor at Freiburg, from 1901 to 1909 at Marburg, from 1909 to his death at Strassburg. He was an authority on modern Greek. His publications include: *Die neugriechische Sprache* (1892); *Handbuch der neugriechischen Sprache* (1895; 2d ed., 1910; for an elaborate summary of this book in English by C. D. Buck, consult *Classical Philology*, vol. ix, pp. 84–96, Chicago, 1914); *Handbuch der Sanskrit* (2 vols., 1905); a revision (the fourth edition) of K. Brugmann's *Griechische Grammatik* (1913).

THUMB, Tom. See Stratton, Charles Sherwood.

THUMB BIBLE. See Bible, Curious Editions of.

THÜMMEL, tụ'mel, Moritz August von (1738–1817). A German statesman and author, born at Schöenfeld. In 1768 he became Minister to Duke Ernest Frederick of Saxe-Coburg, from whose service he retired in 1783. He wrote a humorous prose epic, *Wilhelmine* (1764); a story in verse, *Inokulation der Liebe* (1771); and a partly autobiographical and once very popular novel, in 10 volumes, *Reise in die mittäglichen Provinzen von Frankreich* (1791–1805). *Der heilige Kilian* was posthumously published in 1818. His works (in 6 vols., 1812) were edited by himself with a biography (1820) by Gruner, and reëdited (8 vols., 1854–55).

THUMMIM. See Urim and Thummim.

THUN, tōōn. A town of Switzerland, on the Aar, near where it issues from the Lake of Thun, 19 miles southeast of Bern, 1845 feet above sea level, and one mile from the Lake of Thun (Map: Switzerland, B 2). The old castle of the twelfth century with its corner towers and the Gothic church are the chief buildings. There is a military institution for army officers, as the town is the chief artillery arsenal of Switzerland. The chief manufactures are pottery and bricks. Many tourists visit the town on their way to the Bernese Oberland. Pop., 1900, 6100; 1910, 7415.

THUN, Lake of. A lake in the Canton of Bern, Switzerland, between the town of Interlaken on the east and that of Thun on the northwest (Map: Switzerland, B 2). It is 10½ miles long and 2½ miles wide. The scenery, though scarcely grand, is very attractive. The railway from Thun to Interlaken skirts the south shore.

THUNBERG, tōōn'bĕrk, Carl Peter (1743–1828). A Swedish botanist. He studied with Linnæus at Upsala; sailed with a Dutch ship as surgeon (1771–75), cruising at the Cape of Good Hope; lived six years in Java and Japan, returning in 1779 to Sweden, where he was appointed successor to Linnæus in 1781 as professor of botany at the University of Upsala. To the university he donated his large and valuable collections of plants. He was honorary member of 60 learned societies at home and abroad. A genus of about 50 species of the family Acanthaceæ and numerous Oriental species of other genera are named in his honor. Among his writings are: *Flora Japonica* (1784); *Resa uti Europa, Africa, Asia* (4 vols., 1788–93; Ger., Fr., and Eng. trans.,—*Travels in Europe, Africa, and Asia*, 1796); *Prodromus plantarum Capensium* (2 vols., 1794–1805); *Flora Capensis* (1807–13; new ed., 1823).

THUNDER. See Lightning.

THUNDERCLOUD (c.1856–1916). An American Blackfoot Indian chief, born in Canada. He served as a scout for the United States army in 1872–76, and participated in the capture of Red Cloud (q.v.). He was one of the Indian guides of King Edward VII (then Prince of Wales), when he hunted in the Northwest. Later Chief Thundercloud became famous as an artist's model, posing for Frederic Remington, Edwin A. Abbey, John S. Sargent, Karl Bitter, and Howard Pyle (qq.v.). He is found in many of the historical paintings in the capitol at St. Paul, Minn., which are the work of F. D. Millet, Kenyon Cox, Douglas Volk, and Edwin H. Blashfield (qq.v.). Victor Brenner used his head for the gold coins minted by the government. He died in a lodging house at Rochester, N. Y.

THUNDERING LEGION. See Legion, The Thundering.

THUNDERSTORM. See Brontometer.

THÜNEN, ty̆'nen, Johann Heinrich von (1783–1850). A German economist, born in Oldenburg. After receiving a thorough education in the theory and practice of agriculture and passing two semesters at Göttingen, he bought in 1810 an estate called Tellow, in Mecklenburg-Schwerin, which under his skillful management became famous as a model farm. His fame rests on his work *Der isolirte Staat in Beziehung auf Landwirtschaft und Nationalökonomie*, the first volume of which appeared in 1826, the second in 1850 and 1863, and the third in 1863. In this work Thünen simplified the complex conditions of economic life by imagining an isolated state, circular in form, with land of equal fertility, laborers of equal productivity, and with the sole city and market at the centre. Having so simplified his premises, he proceeded to investigate, principally, the effect of distance from the market upon the agricultural economy of the several zones of the territory surrounding the market. In the second volume Thünen struck a new note in the political economy of his time by protesting against the common treatment of wages as the price of an inanimate commodity, and insisting upon the introduction of ethical factors. His treatment here, as generally, was highly abstract, and with the aid of the differential calculus he arrived at the conclusion that natural wages = $\sqrt{ap}$, where a is the amount required to support the laborer and his family and p is the product of the labor of one man, this product being defined as that part of the gross product remaining after deduction of profits, insurance, and cost of management. This law of wages expresses in a highly interesting way the modern theory that wages vary as the productivity of the laborer. At Thünen's request it was engraved on his tombstone. Consult: H. Schumacher, *J. H. von Thünen, ein Forscherleben* (2d ed., Rostock, 1883); H. L. Moore, in the *Quarterly Journal of Economics*, vol. ix (Boston, 1895). See Political Economy.

THUNNY. See Tunny.

THUN UND HOHENSTEIN, tōōn ụnt hō'en-stīn, Leo, Count (1811–88). An Austrian statesman, born at Tetschen, in Bohemia. Before the revolution of 1848 he was secretary in the Imperial Chancery, and in that year became Governor of Bohemia. From 1849 to 1860 he was Minister of Public Worship and Instruction. He introduced many reforms in educational systems. In 1861 he was elected to the Bohemian Diet, where he became the leader of the Feudalists, and he continued this attitude in the Austrian House of Peers, which he entered in the same year. In 1867 he strenuously opposed the Ausgleich with Hungary. He retired from the Bohemian Diet in 1871, and reëntered it in 1883.

THUR'BER, George (1821–90). An American botanist, naturalist, and editor. He was born at Providence, R. I., where he obtained his early education. From 1850 to 1853 he was botanist, commissary, and quartermaster of the United States Boundary Commission upon the Mexican and United States borders, where he collected a large number of new species of plants. In 1856 he became lecturer upon botany and materia medica in the Cooper Union and College of Pharmacy of New York, and in 1859 professor of botany and horticulture in the Michigan Agricultural College, which institution he left in 1863 to become editor of the *American Agriculturist*, a post which he held until shortly before his death. In addition, he edited various horticultural and agricultural books, and revised and in part rewrote Darlington's *Agricultural Botany*.

THUREAU-DANGIN, tu̦'rō'-däɴ'gäɴ', Paul (1837–1913). A French historian, born in Paris. He was educated at the Lycée Louis le Grand and afterward took up the study of law. In 1893 he was elected to the French Academy, of which he became the permanent secretary in 1908. His literary output, though not large, is notably scholarly. He wrote: *La Pologne et les traités de Vienne* (1863); *Paris, capitale pendant la révolution française* (1872); *Royalistes et républicains* (1874); *Le parti libéral sous la restauration; l'église et l'état sous la monarchie de juillet* (1879); *L'histoire de la monarchie de juillet* (7 vols., 1884–92), his most important work; *Histoire de la renaissance catholique en Angleterre au XIXe siècle* (1906; Eng. trans., ed. and rev. by Wilfred Wilberforce, 2 vols., 1914). He was several times awarded the Gobert prize by the French Academy.

THURET, tu̦'rā', Gustave (1817–75). A French botanist, born in Paris. While attached to the French Embassy at Constantinople he collected plants in the Balkan Peninsula, and returned to France in 1844. His specialty was algæ and his *Recherches sur les zoospores des algues et les anthéridées des cryptogames* (1851) were crowned by the academy. Other publications include *Recherches sur la fécondation des Fucacées* (1855–57), and numerous monographs, such as *Essai de classification des Nostochinées* (1875). He established a splendid botanical garden at Antibes, where he planted the first eucalyptus trees in Europe, and which he bequeathed to the state. He died at Nice.

THURGAU, to͞or'gou, or Thurgovie. A canton in the northeast of Switzerland, separated from Germany by Lake Constance (Map: Switzerland, D 1). Area, 381 square miles. The surface is elevated but not mountainous, and is cut by the valley of the Thur, the chief river of the canton. Almost the entire area of the canton is productive, and the chief occupations of the inhabitants are agriculture and viticulture. Stock raising and cheese making are also important industries. The principal manufactures are cotton and woolen goods, knit goods, machinery, leather, etc. The constitution of the canton, dating from 1869, is purely democratic, the members of the Legislative Assembly as well as of the Executive Council being elected directly by the people. The obligatory referendum and the initiative are in force. Pop., 1900, 113,221; 1910, 134,055, largely German-speaking Protestants. Capital, Frauenfeld (q.v.).

Prior to the ninth century the country known as Thurgau comprised almost the entire region bounded by Lake Lucerne, the Rhine, the Reuss, and Lake Constance. With the extinction of the house of Kyburg, Thurgau, reduced almost to its present size, passed in 1264 to the house of Hapsburg. In 1460 the country was seized by the Confederates and occupied the position of a subject district until 1798, when it was made a canton of the Helvetic Republic. In 1803 it was constituted a canton of the reorganized Swiss Confederation. Consult Meyer, *Thurgauisches Urkundenbuch* (Frauenfeld, 1881 et seq.), and Pupikofer, *Geschichte des Thurgaus* (ib., 1884–89).

THU'RIBLE. See Censer.

THU'RIFER (Lat., incense bearer). The attendant in the Roman Catholic church, at solemn mass, vespers, and other ceremonies, whose duty it is to carry the thurible, or incense vessel, and either to minister incense himself, or to present the thurible for that purpose to the officiating priest. The office of thurifer originally belonged to the so-called minor order of acolyte, but is now commonly exercised by laymen. See Censer; Incense.

THU'RII. A city in Magna Græcia (southern Italy), founded by the people of the neighboring city of Sybaris (q.v.) after the destruction of the latter. In 443 B.C. a colony, of which Herodotus (q.v.) was a member, went from Athens to Thurii. For a long time the city prospered. It formed an alliance with the Romans in 282 B.C., but was plundered by Hannibal in 204 B.C. A Roman colony came to the city in 193 B.C., but the city declined presently and at last was wholly deserted. Only scanty ruins remain.

THÜRINGER WALD, tu̦'ring-ĕr vält (Ger., Thuringian Forest). A mountain range of central Germany, extending from the banks of the Werra near Eisenach in a southeasterly direction to the north boundary of Bavaria, where it joins the Frankenwald, a ramification of the Fichtelgebirge (Map: Germany, D 3). It forms the southwest boundary of the trough of Thuringia, which in outward features resembles a plateau extending to the Harz Mountains. Length, about 70 miles; highest summit, Gross-Beerberg, 3238 feet. The range falls steeply towards the northeast and is covered to the summits with magnificent pine forests. The Triassic deposits which once clothed its surface have been worn away, exposing older granites, porphyries, and schists. It is rich in minerals, among which iron ore, copper, manganese, and gypsum are the most important. The range passes through a well-populated industrial region.

THURIN'GIA (Ger. *Thüringen*). A picturesque region of Germany, traversed by the Thüringer Wald (q.v.), lying between the Prussian Province of Saxony on the north and Bavaria on the south, and between the Kingdom of Saxony on the east and the Prussian Province of Hesse-Nassau on the west (Map: Germany, D 3). It embraces a number of duchies and principalities together with some Prussian districts. The so-called Thuringian states are Saxe-Weimar-Eisenach, Saxe-Coburg-Gotha, Saxe-Meiningen, Saxe-Altenburg, Schwarzburg-Rudolstadt, Schwarzburg-Sondershausen, and the two Reuss principalities. The largest city is Erfurt, in the Prussian Province of Saxony. The region took its name from the Thuringians, who at the time of the great migration of nations established an extensive kingdom near the centre of the present Germany. In the early part of the sixth century the Franks overthrew this kingdom, of which the northern part was joined to the country of the Saxons and the southern to Franconia. The name Thuringia came to be applied to the country between the rivers Werra and Saale and the Harz and Thuringian mountains. Under the weak Merovingian rulers dukes arose in this Thuringia, which for a time was virtually independent. Christianity was introduced in the eighth century. Under the Carlovingian sovereigns Thuringia constituted an important frontier province or march, whose Governor was charged with the task of repressing or keeping down the Slavic Serbs. In the tenth century the country was under the rule of the dukes of Saxony. In the twelfth and thirteenth centuries the landgraves of Thuringia held a prominent place among the German princes. They had their seat at the famous Castle of Wartburg. (See EISENACH.) Landgrave Hermann I (1190–1216) is noted as a patron of the minnesingers. The old dynasty of landgraves became extinct in 1247. The Landgraviate of Thuringia then passed to the house of Wettin, which ruled in the Margraviate of Meissen, and which in the fifteenth century came into possession of the electoral Duchy of Saxony. On the partition of the Saxon dominions in 1485 between the Ernestine and Albertine lines the bulk of the Thuringian possessions passed to the Ernestine or electoral branch. After the War of the Schmalkald League (1546–47) the Ernestine house was stripped of its possessions outside of Thuringia. Here arose the various modern Saxon (Thuringian) duchies. (See SAXE-WEIMAR.) Consult: Thomas Knockenhauer, *Geschichte Thüringens in der karolingischen und sächsischen Zeit* (Gotha, 1863); id., *Geschichte Thüringens zur Zeit des ersten Landgrafenhauses* (ib., 1871); Ernst Devrient, *Thüringische Geschichte* (Leipzig, 1907).

THURIN'GIAN DIALECT. See GERMAN LANGUAGE.

THURINGIAN FOREST. See THÜRINGER WALD.

THURLOE, thûr'lô, JOHN (1616–68). An English Puritan statesman. After Cromwell was proclaimed Protector, Thurloe was appointed chief of the intelligence department, a position which he managed with striking fidelity and success. He continued as Secretary of State under Richard Cromwell until May, 1659, and in spite of royalist opposition in 1660 was reappointed prior to the Restoration. After Charles II's return he was arrested on a charge of high treason, but soon afterward was freed on condition of attending on the secretaries of state whenever they should require his service. His large collection of state papers and correspondence, comprising the most authentic materials respecting the period of the Civil War and Cromwell's Protectorate, were discovered in a secret recess in his chambers at Lincoln's Inn during the reign of William III, and are now in the Bodleian Library at Oxford. Dr. Thomas Birch issued a *Collection of State Papers; containing authentic memorials of the English affairs from the year 1638 to the Restoration of King Charles II, published from the originals, etc.*, prefixed by a *Life* of Thurloe (London, 1742).

THUR'LOW, EDWARD, BARON (1731–1806). An English lawyer. He was born at Bracon-Ash, Norfolk, was educated at Caius College, Cambridge, and was admitted to the bar in 1754. At this time he formed an intimate friendship with the poet William Cowper. Through the patronage of the Viscount Weymouth, Thurlow was elected to Parliament for Tamworth in 1768. In 1770 he was appointed Solicitor-General and the next year Attorney-General. He attracted the favorable notice of George III by zealously supporting the governmental policy of coercing the American Colonies, and in 1778 was made Baron Thurlow of Ashfield and Chancellor of the Exchequer, which office he retained under the Rockingham administration. Under the coalition ministry he was compelled to retire; but he was restored as Chancellor when Pitt came to power. For a time he supported the government; but, relying on the favor of the King, he finally ventured to oppose the measures of his colleagues. Pitt then intimated that he or Thurlow must retire, and the King consented to the removal of Thurlow (1792). Consult Edward Foss, *Judges of England, with Sketches of their Lives* (London, 1848–64).

THUR'MAN, ALLEN GRANBERY (1813–95). An American political leader and legislator, born in Lynchburg, Va. In 1819 he was taken by his parents to Chillicothe, Ohio. He studied law in the office of his uncle, William Allen (1806–79; q.v.), became private secretary to Governor Robert Lucas in 1834, and in 1835 was admitted to the bar and became a partner of Allen. In 1845–47 he was a Democratic member of Congress, then resumed his law practice, and from 1851 to 1856 was on the bench of the Ohio Supreme Court, after December, 1854, as Chief Justice. In 1867 he was the Democratic candidate for Governor of Ohio, but was defeated by R. B. Hayes. From 1869 to 1881 he was a member of the United States Senate, and the leader of the Democrats in that body. In the Forty-sixth Congress he was elected President pro tempore of the Senate. He was active as an advocate of a liberal reconstruction policy, was one of the authors of the bill creating the Electoral Commission in 1876, and a member of that body. He was also the author of the well-known Thurman Act, designed to compel the Pacific railroads which had received government aid to fulfill their obligations to the government, and secured the passage of the bill. In 1881 he was appointed by President Garfield a member of the International Monetary Conference at Paris. In 1888 he was nominated by acclamation for Vice President on the Cleveland ticket, which was defeated by Harrison and Morton. Consult Hensel and Parker, *Lives and Public Services of Grover Cleveland and Allen G. Thurman* (Philadelphia, 1892).—His son, ALLEN W. THURMAN (born 1847), was prominent as a Democrat in Ohio and became president of the Special State Canal Commissioners.

THURN tōōrn, HEINRICH MATTHIAS, COUNT (1580–1640). A leader of the Bohemian Protestants in the Thirty Years' War. For his services in the Turkish wars the Emperor Rudolph II made him Burgrave of Karlstein in Bohemia. He was among those who wrung from Rudolph the *Majestätsbrief* of 1609, an edict of toleration, and was named by the Bohemian estates one of the Thirty Defenders of the Faith. He was deprived of his estates and title soon after. On May 23, 1618, he gave the signal for the Protestant uprising in Bohemia by the defenestration of the Imperial legates at Prague. (See THIRTY YEARS' WAR.) At the head of the Protestant forces he besieged the Emperor Ferdinand II in Vienna (1619), but was finally compelled to withdraw. After the battle of the White Hill in 1620, in which the army of Frederick, the Protestant King of Bohemia, was vanquished, he sought refuge with Bethlen Gábor, ruler of Transylvania. In 1626 he commanded a corps in Silesia. Later he joined Gustavus Adolphus, and fought at Leipzig (1631) and Lützen (1632).

THURNEYSEN, tōōr'nī-zen, RUDOLPH (1857–). A German Celtic philologist. He was born in Basel, and studied at the universities of Basel, Leipzig, Berlin, and Paris. From 1882 to 1887 he was successively privatdocent and assistant professor of Romance philology in the University of Jena, and then was professor of comparative philology at the University of Freiburg in Baden. In 1912 he was called to a similar chair at Bonn. He wrote: *Ueber Herkunft und Bildung der lateinischen Verba auf -io* (1879); *Das Verbum être und die französische Conjugation* (1882); *Keltoromanisches* (1884); *Der Saturnier* (1885); *Mittelirische Verslehren* (1891); *Sagen aus dem alten Irland* (1901); *Handbuch des altirischen* (2 vols., 1909).

THURS'BY, Emma (1857-). An American singer, born in Brooklyn, N. Y. She studied in the United States under Julius Meyer, Errani, and Madame Rudersdorff, and also abroad. She made a successful tour of the United States and Canada (1875), and was warmly received in England and France (1878-79), afterward being engaged by Maurice Strakosch as prima donna of his company (1880). A subsequent tour of the United States with Theodore Thomas was especially successful. In 1903 she made a tour of Japan and China. In her prime she was frequently compared with Patti.

THUR'STON, John Mellen (1847-). An American politician and lawyer, born in Montpelier, Vt. He removed to Wisconsin, where he was educated at Wayland Academy, Beaver Dam, in 1869 was admitted to the bar, and in the following year took up the practice of law at Omaha, Neb. He allied himself with the Republican party, and was elected to the State Legislature in 1875. In 1895-1901 he served as United States Senator and in the latter year was a commissioner for the Louisiana Purchase Exposition at St. Louis. He was chairman of the Republican National conventions in 1888 and 1896. From 1888 he was general counsel of the Union Pacific Railway.

THURSTON, Katherine Cecil (c.1864-1911). A British novelist, born in Cork, Ireland. In 1901 she was married to Ernest T. Thurston, an English novelist, from whom she subsequently secured a divorce. She is principally known for her novel *The Masquerader* (published in England as *John Chilcote, M.P.*, 1904), which had a large and deserved success. Other of her books include: *The Circle* (1903); *The Gambler* (1906); *Mystics* (1907); *The Fly on the Wheel* (1908); and *Max* (1910).

THURSTON, Robert Henry (1839-1903). An American engineer and educator, born in Providence, R. I. He graduated at Brown University in 1859. During the Civil War he served in the Federal navy as an engineer, and in 1865 he was appointed assistant professor of natural and experimental philosophy at Annapolis. He was professor of engineering at Stevens Institute of Technology from 1871 to 1885, and in the latter year conducted a series of important experiments on steam boilers. Thurston was a member of the United States Scientific Commission to the Vienna Exhibition in 1873, and edited the *Report* of the commissioners, which included his individual report on machinery and manufactures (1875-76). From 1885 till his death he was director of Sibley College, Cornell, and professor of mechanical engineering in the university. His thoroughness, organizing ability, and genius as a teacher placed him in the front rank of educators in his field. His writings, notably influential because clear, comprehensible, and reliable, include: *A History of the Growth of the Steam Engine* (1878; 4th ed., rev., 1902; Ger. and Fr. trans.); *Manual of Steam Boilers* (1888; 7th ed., 1901); *Manual of the Steam Engine* (1891; 5th ed., 1900-02); *Materials of Engineering* (3 vols., 1883-84; new ed., 1907-10); *Stationary Steam Engines* (1884; 7th ed., 1902); *Treatise on Friction and Lost Work in Machinery and Mill Work* (1885; 7th ed., 1903); *A Handbook of Engine and Boiler Trials, and of the Indicator and Prony Brake* (1890; 5th ed., 1903); *A Textbook of the Materials of Construction* (1890; 6th ed., 1900); *Life of Robert Fulton* (1891). Professor Thurston's inventions include a magnesium-ribbon lamp, a magnesium-burning naval and army signal apparatus, and autographic recording and testing machine, a steam-engine governor, and an apparatus for determining the value of lubricants. From 1880 to 1883 he served as first president of the American Society of Mechanical Engineers. Consult W. F. Durand, *Robert Henry Thurston* (Washington, 1904).

THURY, tụ'rē', Vicomte de. See Hericart-Ferrand, L. E. F.

THUSNELDA. See Germanicus Cæsar.

THWAITES, thwāts, Reuben Gold (1853-1913). An American historical writer, born in Dorchester, Mass. In 1866 he removed to Wisconsin. From 1876 to 1886 he was managing editor of the *Wisconsin State Journal*, at Madison. From 1886 he was secretary and superintendent of the State Historical Society of Wisconsin. In 1899 he was president of the American Library Association. He edited the *Wisconsin Historical Collections* (vols. xi-xix, 1888-1911); *The Jesuit Relations* (73 vols., 1896-1901); *Early Western Travels, 1748-1846* (32 vols., 1904-07); *Original Journals of Lewis and Clark* (7 vols., 1905); and similar works. He also published: *Down Historic Waterways* (1888; 2d ed., rev., 1902); *The Colonies, 1492-1750* (1891); *Daniel Boone* (1902); *Father Marquette* (1902); *George Rogers Clark* (1903); *Brief History of Rocky Mountain Exploration* (1904); *France in America* (1905); *Wisconsin* (1909); *School History of the United States* (1912). For a critical analysis of the work of Thwaites consult an article by C. W. Alvord, *Proceedings of the Mississippi Valley Historical Association* (Cedar Rapids, Ia., 1913-14); consult also F. J. Turner, *Reuben Gold Thwaites* (Madison, Wis., 1914).

THWING, twing, Charles Franklin (1853-). An American clergyman and educator, born at New Sharon, Me. He graduated from Harvard in 1876, and from the Andover Theological Seminary in 1879; was pastor of churches in Cambridge, Mass., and in Minneapolis, and in 1890 became president of Adelbert College and Western Reserve University at Cleveland, Ohio. He published: *The Reading of Books* (1883); *The Family* (1886; 2d ed., 1913), with Carrie F. Butler Thwing; *Within College Walls* (1893); *College Administration* (1900); *History of Higher Education in America* (1906); *Education in the Far East* (1909); *A History of Education in the United States since the Civil War* (1910); *Universities of the World* (1911); *Letters from a Father to his Son Entering College* (1912); *Letters from a Father to his Daughter Entering College* (1913); *The American College* (1914).

THYESTES, thī-ĕs'tēz (Lat., from Gk. *Θυέστης*). The son of Pelops (q.v.) and Hippodamia. Having seduced Ærope, the wife of his brother Atreus (q.v.), he was banished from Mycenæ (q.v.), and in revenge sent Plisthenes, the son of Atreus, whom he had brought up, to slay his father. Atreus, not recognizing Plisthenes, killed him. In revenge, summoning Thyestes to Mycenæ, he placed before him at a feast the flesh of Thyestes' two sons.

THY'LACINE. See DASYURE.

THYME, tīm (OF., Fr. *thym*, from Lat. *thymum*, from Gk. *θύμον*, *θύμος*, *thyme*, sweetbread, warty excrescence; connected with *θύος*, *thyos*, incense), *Thymus*. A genus of humble half-shrubby plants, of the family Labiatæ, having a two-lipped calyx and four diverging stamens. Garden thyme (*Thymus vulgaris*) is 6 to 10 inches high, with narrow, almost linear leaves, and whitish or reddish flowers, which grow in separate whorls, six in a whorl. It is common upon dry hills in southern Europe, and is cultivated in gardens for its fragrance and as a culinary herb. It is also used in medicine. Wild thyme (*Thymus serpyllum*) has a procumbent stem with many branches, 2 to 3 feet long, oval leaves, and purplish flowers, arranged in whorls, which are united in a head. It is abundant on hills and mountains in all parts of Europe and northern Asia. It is less fragrant than garden thyme, but both species contain an aromatic essential oil. The lemon thyme, or lemon-scented thyme, is a variety of *Thymus serpyllum*, generally of lower growth than the common thyme. No species is indigenous in America.

GARDEN THYME.

THYMOL, tīm'ŏl *or* -ōl. The active principle of the oil of thyme, having powerful antiseptic and anæsthetic properties. Its chemical formula is $C_{10}H_{14}O$. It occurs in large, colorless plates, having a thymelike odor, which are slightly soluble in water and readily soluble in alcohol. Besides its employment in the form of a spray in infections of the upper respiratory tract, it is given in intestinal affections and is almost a specific in hookworm disease (q.v.).

THY'MUS GLAND (Neo-Lat., from Gk. *θύμος*, *thyme*, so called from its fancied resemblance to a branch of sweet thyme). A ductless gland, peculiar to infantile life. In the human being it occupies a space in the neck below the thyroid gland and in the chest beneath the sternum in the anterior mediastinal space, on the level of the fourth costal cartilage. The gland is developed early in fœtal life, increases in size during the first two or three years of life, then remains stationary until the tenth to the fourteenth year, when it begins to atrophy and undergo fatty degeneration. At its maximum development the organ is over 2 inches long, 1½ inches broad, and about ⅛ of an inch thick. At birth its weight is normally about half an ounce. Comparatively little is known of the function of this organ, but it is believed to manufacture an internal secretion, which has a profound influence on growth and development, and is concerned in the retention of the calcium salts by the body for the formation of bone. The thymus gland of young animals such as the lamb and calf constitutes the delicacy known as sweetbreads, though the pancreas or belly sweetbread of certain animals is often substituted in trade for this article. Thymus has been used in medicine in the treatment of malnutrition, delayed growth, rickets, and rheumatoid arthritis. See ALIMENTARY SYSTEM; ORGANOTHERAPY.

THY'NI. See BITHYNIA.

THY'ROID GLAND (from Gk. *θυρεοειδής*, *thyreoeidēs*, shield-shaped, from *θυρεός*, *thyreos*, large oblong shield, from *θύρα*, *thyra*, door + *εἶδος*, *eidos*, form). One of the ductless or vascular glands, lying at the upper part of the trachea, and consisting of two lateral lobes, placed one on each side of this canal, and connected together by a narrow transverse portion at the lower third, called the isthmus. It is of a brownish-red color and its normal weight is about an ounce. Each lobe is somewhat conical, and is about 2 inches long and ¾ of an inch broad. Minute examination of the gland shows it to consist of lobes and lobules held together by connective tissue. Each lobule is made up of numerous completely closed sacs 0.04 to 0.1 inch in diameter. The sacs contain a transparent, viscid, albuminous fluid. Each sac is surrounded by a plexus of capillary blood vessels which do not pierce the lining of the sacs. Numerous lymphatic vessels are also present. At an early period the sacs dilate, their cellular lining atrophies, and their contents undergo colloid degeneration. The function of the thyroid gland is mainly the production of an internal secretion which influences bodily nutrition in many ways. It is subject to several varieties of enlargement known under the general name of goitre, and is also the seat of various benign and malignant tumors. *Myxœdema* (q.v.) is a condition of the system brought about through loss of function of the thyroid gland, either from atrophy or removal of the organ. The prepared extract of the thyroid gland of the sheep is used in the treatment of this condition. See ALIMENTARY SYSTEM; CRETINISM; ORGANOTHERAPY; SECRETIONS, INTERNAL.

THYR'SUS (Lat., from Gk. *θύρσος*, stalk, stem). An ivy and vine wreathed staff tipped with a pine cone, which was carried by Bacchus (q.v.) and his followers in their religious rites.

THYSSEN, *tēs'sen*, AUGUST (1840–). A German industrial leader. He engaged in the iron industry in the late sixties at Duisburg, but after 1871 lived at Mülheim-Ruhr, where he founded the firm of Thyssen and Company, the parent house of his many industrial interests. He became the chief owner of a mining company employing about 18,000 men, of 641 coke ovens, and of 7 blast furnaces. He built the first 500-ton blast furnace in Germany, the first 100-ton Martin furnace, and the first large tube works.

TI, tē (Polynesian name), *Cordyline terminalis*. A treelike plant of the family Liliaceæ, found in southeastern Asia, the eastern Archipelago, and the Hawaiian and other Pacific islands. It sometimes exceeds 12 feet in height. The reddish, lanceolate leaves are used as cattle food and as thatch for houses, as food wrappers, etc. Their fibres are sometimes made into cloth. The large, hard, fibrous, and almost insipid root becomes soft and sweet when baked. It is very nutritious, and is much used as an article of food. The juice is used for making sugar, a fermented beverage, and a distilled liquor. Fully 25 varieties of Cordyline are grown under glass for their ornamental, often variegated, foliage. See Hog Plum.

TIAHUANACO, tē-ä'wȧ-nä'kō. A ruined city of Bolivia, a few miles from the Peruvian frontier, on an arid plain midway between lakes Titicaca and Aullagas, at an elevation of 12,900 feet. The present town of the same name stands a short distance from the ruins and is built for the most part of beautifully cut stones from the ancient buildings. In the ruined town five great structures besides an equal number of shapeless mounds may be traced. These buildings are commonly known as the Fortress, the Temple, the Palace, the Hall of Justice, and the Sanctuary. The fortress consists of a rectangular mass of earth 620 feet long, 450 feet wide, and about 50 feet high, supported by walls of stone forming terraces, the walls sloping inward. On the summit are traces of rectangular buildings. Adjoining the pyramid to the east is a rectangular apron mound. The Fortress has been almost destroyed by excavations for treasures, but these diggings show that there were subterranean structures within the mound. All the buildings of Tiahuanaco are oriented to within 10 degrees of the cardinal points. The Temple, believed to be the oldest building here, is a rectangle 388 by 455 feet, defined by erect stones between 8 and 10 feet high, 2 by 4 feet broad, and from 20 to 30 inches thick. On the eastern side, aligned along a lower terrace, are 10 columns about 15 feet high, by 4 feet by 3 feet. The interior of the rectangle is raised 8 feet above the level of the ground and has a sunken court 280 feet long and 190 feet broad. To the east of the Temple is the Palace, of which the massive foundation remains, composed of blocks of trachyte 8 to 10 feet long and 5 feet wide. The piers of this building are deeply sunk in the ground and rest on a pavement of cut stones. The Hall of Justice stood at one end of a sunken court in a rectangle in plan like that of the Temple. It was a platform 131 feet long and 23 broad, built of enormous blocks of stone, and had three groups of alcoves or seats arranged at the ends and in the centre, and between the central and side groups were monolithic doorways with sculptured friezes. The Hall of Justice also stands on a raised area, in the centre of which was a building about 50 feet square, constructed of very large stones, and called the Sanctuary. Within the building is a slab of stone 13 feet 4 inches square and 20 inches thick. On its surface is cut what seems to be the plan of a building resembling that of the Fortress, and six niches in which perhaps statues were located.

Tiahuanaco is famous for its great monolithic gateway of hard trachyte 13 feet 5 inches long, 7 feet 2 inches high above ground, and 18 inches thick. The lintel over the front of the gateway is sculptured in low relief and the back is carved to represent doors and windows. The masonry at Tiahuanaco is laid without mortar, the stones on each course are tongued and grooved at the ends, and bronze pins and T-clamps were employed to hold the courses in place. Earlier travelers speak of statuary at Tiahuanaco, but these pieces have been destroyed except a head, which belonged to a figure probably about 18 feet high. The building stone was transported from 15 to 40 miles and the dressing was done with bronze and stone tools. There is no reliable tradition as to the builders, who it is supposed were the Incas or Aymarás, and no reason can be assigned for the location of the city on a barren plain at a great altitude, unless it be that the foundation was determined by religious ideas. Consult Stübel and Uhle, *Die Ruinenstätte von Tiahuanaco* (Breslau, 1892).

TIAN-SHAN, tē-än' shän', or Celestial Mountains. A great mountain system of Central Asia 1500 miles long (Map: Asia, J, K 4). It begins near the Desert of Gobi in a rocky crest, and, running southwestward, is joined by a second, a third, and many other ranges, which, as they advance westward, open out more or less fanwise, the several ranges being connected by intervening plateaus, and continuing to preserve somewhat of a parallel direction. Towards the centre the plateau is 250 miles wide, while to the west the ridges become reduced in number, and sink into the plains about Tashkend, in southeast Russian Turkestan. It forms the north boundary of the great Tarim Basin, which it separates from the watersheds of Lake Balkash and the Syr-Darya. It is connected by broken ranges with the Altai Mountains to the north, and, through the Sarikal, with the Kuen-lun, Hindu-Kush, and Himalaya systems. In the central portion there is a main ridge forming an unbroken wall covered with perpetual snow throughout its length, and culminating in the west in the Khan-Tengri, a peak bearing enormous glaciers and reaching an altitude of 24,000 feet. East of this ridge the mountains descend in a broad plateau with scattered peaks and ridges from 6000 to 10,000 feet high. In the west portion there are several important passes affording routes between Russian and East Turkestan. The system incloses numerous large longitudinal valleys whose bottoms form wide steppe regions. Above, the slopes are covered with spruce forests succeeded by an alpine flora to the snow line. The loftiest group in the eastern portion, the Bogdo-ola, is held sacred by the Mongolians. Consult Gottfried Merzbacher, *Central Tian-Shan Mountains* (New York, 1905).

TIARA, tī-ä'rȧ *or* tē-ä'rȧ (Lat. *tiara*, *tiaras*, from Gk. *τιάρα*, *τιάρης*, headdress of the Persian kings). The triple crown of the Pope. Although a cap called a tiara was worn by some Oriental monarchs, as by the Achæmenid dynasty of Persia, as an ecclesiastical headdress it has more affinity with that of the Jewish high priests, the form of which is more or less preserved in the mitres worn by the bishops of the Eastern church to-day. (See Costume, Ecclesiastical.) It is composed of a high cap of gold cloth, encircled by three coronets, with a mound and cross of gold on the top. From the cap hang two pendants, embroidered and fringed at the ends. The original papal crown consisted of the cap alone, and was first used by Pope Nicholas I (858–867). Alexander II added a second coronet about 1065, and Urban V (1362–70) the third. A symbolic meaning has since been found in the triple crown, as representing the authority of the Pope over the Church militant, expectant, and triumphant. It is placed on the Pope's head at his coronation by the second cardinal deacon, with the words "Receive the tiara, adorned with three crowns, and know that thou art father of princes and kings, ruler of the world, vicar of our Saviour Jesus Christ." At ceremonies of a purely spiritual character the Pope wears the mitre, like other bishops, not the tiara. See Crown.

TIBALDI, tē-bäl'dē, Pellegrino (1527–98).

An Italian architect and painter, born at Bologna. A pupil of Daniele da Volterra in painting, he subsequently worked both as an architect and painter under the influence of Michelangelo in Rome, whither he had gone in 1547. His graceful altar pieces, especially attractive through the loveliness of the female heads, are very rare. Of his frescoes "Hercules Taming the Animals" may still be seen in the Loggia dei Mercanti (Exchange) at Ancona. He is important also as an architect of the late Renaissance, especially in Milan where (1560-70) he designed the Jesuit church of San Fedele, reconstructed the archiepiscopal palace, and designed the baroque façade of the cathedral. Called to Madrid by Philip II in 1586 to take part in the erection of the Escorial, Tibaldi also decorated its library with warmly colored frescoes, was created Marchese di Valsolda, and after nine years returned to Milan, where he died. Consult Zanotti, *Le pitture di Pellegrino Tibaldi* (Venice, 1756), and Gurlitt, *Der Barockstil in Italien* (Stuttgart, 1887).

TIB′BUS, TIBUS, or **TUBUS** (rock people). A people inhabiting Tibesti, in the eastern Sahara, and extending southward into the Sudan. Von Luschan regards them as possibly related to the central Sudanese negroes such as the Kanuri. In these different areas they vary greatly in hair and features. There are only 70,000 of them spread over an area of 300,000 square miles, under the names, Tedas, Dasas, Bedeyat, Zoghawa, and Bulzeda. For generations they have been active in the traffic by caravan across the Sahara. In religion they are Mohammedan. Consult Rohlfs, *Quer durch Afrika*, vol. i (Leipzig, 1874), and Nachtigal, *Sahara und Sudan* (Berlin, 1879-89).

TI′BER (Lat. *Tiberis*, poetical *Thybris;* Ital. *Tevere*). The principal river of central Italy. It rises in Tuscany, at the south of the Monte Fumajolo, in the Province of Arezzo, about 30 miles east of the source of the Arno, at an altitude of more than 3600 feet above the level of the sea, and flows towards the south in a winding course, across Perugia (Umbria). After receiving the waters of many small streams, at Orte, where it is joined by the Nera (the ancient Nar), it forms the boundary between Umbria and Rome, encircling Mount Soracte and entering the Campagna Romana (Map: Italy, D 4). About three miles above Rome it is swelled by the Anio (now Aniene or Teverone), then passes through the city of Rome, where it forms an island, the Insula Tiberina (now Isola di San Bartolommeo), and enters the Tyrrhenian Sea about 26 miles below.

The total length of the Tiber is 245 miles; its breadth at Rome is about 250 feet. It is a swift-running stream, carrying down an enormous amount of alluvial matter, which, in solution, gives the water that yellowish color for which the flavus Tiberis was renowned. The sediment deposited at the mouth of the Tiber is pushing out the land at the rate of about ten feet a year, so that the ruins of Ostia, the ancient harbor of Rome, are now more than four miles inland. The delta is formed of two mouths; the fiumicino, originally a channel dug by Trajan for his harbor (Portus Traiani), now the larger and navigable branch, and the fiumara, now almost choked by sand banks; and these inclose the Isola Sacra, a desolate and unhealthful island once sacred to a Venus. The Tiber is navigable by small steamers as far as Rome, and by smaller craft 60 miles higher up. It is subject to frequent and often disastrous inundations, of which the ancient writers have recorded no less than 23. Among the more famous floods are that mentioned by Horace (*Odes*, 1, 2), that of 1598, when the water at Rome rose 51½ feet, and that of 1900, when it reached a flood height of almost 54 feet. To remedy this evil, the government, beginning in 1876, constructed massive embankments at Rome, at the expense of more than $25,000,000; but the carefully planned work has proved defective. The stream on the north of the Tiber island has become clogged with sand, and in the flood of 1900 fully a quarter of a mile of the south embankment was carried away by the water. Consult Narducci, *Saggio di Bibliografia del Tevere* (Rome, 1876), and S. A. Smith, *The Tiber and its Tributaries* (London, 1877).

TIBE′RIAS, Lake or Sea of. A lake in Palestine. See Galilee, Sea of.

TIBE′RII CAS′TRUM. The Roman name of the site now occupied by the Bavarian town of Lindau (q.v.).

TIBE′RIUS (Tiberius Claudius Nero Cæsar) (42 B.C.-37 A.D.). The second Emperor of Rome (14-37 A.D.). He was the son of Tiberius Claudius Nero and Livia Drusilla (q.v.), and was adopted by Augustus (q.v.) when the latter married Livia in 38 B.C., after her compulsory divorce. He was carefully educated, and early manifested intellectual power and military skill. His first important command was the expedition sent in 20 B.C. to restore Tigranes (q.v.) to the throne of Armenia. A more noteworthy commission was given him in 15 B.C., when, in company with his younger brother Drusus (q.v.), he defeated the Rhætians. Two years later he was consul with P. Quintilius Varus, and in 11 B.C. he fought successfully against the Dalmatians and Pannonians. The death of Drusus in 9 B.C. recalled Tiberius to Germany, but in 7 B.C. he held the consulship for the second time. The troubles which were to overshadow his life had, however, already begun. In 11 B.C. he had been forced by Augustus to divorce his wife, Vipsania Agrippina, whom he loved deeply, and to marry the Emperor's daughter Julia, the widow of Marcus Vipsanius Agrippa (q.v.). Her conduct, and perhaps his own jealousy of the growing favor of Gaius and Lucius Cæsar, the two grandsons of Augustus, children of Julia and Agrippa, led him to retire, against the Emperor's will, to Rhodes in 6 B.C., the year in which the tribunician power was conferred upon him for five years. He remained in Rhodes seven years, and before his return Julia had been banished for life to the island of Pandataria. The death of Lucius Cæsar in 2 A.D. and of Gaius in 4 led Augustus to adopt Tiberius as his heir. From this time until the Emperor's death Tiberius was in command of the Roman armies, and campaign followed campaign. In 4 A.D. he reduced Germany from the Rhine to the Elbe, from 6 to 9 he waged war again in Dalmatia and Pannonia, and from 10 to 11 he held the Rhine against the Germans who had defeated Varus (q.v.). In 12 he was honored with a well-earned triumph.

When the death of Augustus occurred, August 19, 14, Tiberius was on his way to Illyricum. He was summoned home by his mother, and at once assumed control of the Empire. Despite his execution of Postumus Agrippa, the grandson of Augustus, his reign was at first beneficent. Gradually, however, a change took place in Tiberius. He minimized the power of the people, and transferred the election of magistrates from them to the Senate. At the same time he watched with suspicion the increasing popularity of Germanicus Cæsar (q.v.), his nephew. In 19 Germanicus died, poisoned, reports current at the time declared, at the instigation of his uncle. About this time the evil genius of the reign of Tiberius, Ælius Sejanus (q.v.), gained his ascendancy over the Emperor. Under his influence a system of espionage was instituted which doomed all who in any way opposed Tiberius. Freedom was abolished in Rome, the Senate was demoralized, and the Emperor sank to the level of a cruel and ruthless tyrant. In 23 Sejanus abetted the murder of the only son of Tiberius, Drusus Cæsar (q.v.). Three years later the Emperor left Rome with Sejanus, going first to Campania and in 27 to Capri, where he remained till his death.

In 29 Livia Drusilla died, thus removing one of the last barriers to the complete degeneration of her son. Two years later Tiberius learned of the treachery and ambition of Sejanus, who was put to death, only to be replaced by Macro, as corrupt as his predecessor. In 37 Tiberius died, smothered, though already on his death bed, by Macro, and was succeeded by Caligula (q.v.). The reign of Tiberius was beneficial to the Empire at large, and the provinces especially flourished under his sway. Only in Rome, and only where his personal interests were at stake, was he merciless.

The writings of Tiberius have been lost. His style is said to have been obscure, archaic, and affected. He wrote a brief autobiography, a lyric on the death of Lucius Cæsar, and a number of Greek poems.

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TIBERIUS CLAUDIUS. See CLAUDIUS I.

TIBET, or **THIBET,** tĭb′et *or* tĭ-bĕt′. A province in Central Asia forming the southwest part of China, and under the suzerainty of that country. In its main features it is now fairly well known through the efforts of many explorers, in spite of the policy of exclusion. The name long covered half of Kashmir in the west occupied by peoples of Tibetan origin. But three regions are now excluded from Tibet: (1) Little Tibet, between 74° and 79° east long., now included in Kashmir, and composed of Baltistan and Ladakh (qq.v.); (2) and (3) the two regions known as Ku-ku-nor and the Ts'aidam, or Ch'aidam, lying south of the Nanshan, east of the Altin-tagh, and north of the curve formed by the eastern and southeastern extension of the Kuen-lun system, bearing the names of Akka, Tolai, Angirtekshia, Barkhan-Bhōba, Shuga, etc. Area, 463,200 square miles.

Physical Features. Tibet is the highest and most massive plateau in the world, suspended between the two great continental chains of the Kuen-lun and the Himalaya. This lofty tableland contrasts sharply with the lowlands of Hindustan on one side of it and the desert of the Tarim basin on the other, the latter being one of the lowest depressions in the interior of any continent; so that the highest plateau on the earth's surface rises close to one of the deepest depressions in the interior of the dry land. Within the mountains forming the periphery of this wide-spreading highland three distinct physical features may be recognized: (1) The great plain stretching away from the western confines of Tibet for about 700 miles east and spanning the parallels of latitude between the Kuen-lun and the valley of the Sanpo, which collects the northern drainage of the Himalaya; (2) the valleys and ranges of south Tibet, including the valley of the Sanpo or upper Brahmaputra; and (3) the intricate system of ranges and gorges in the east and southeast which contain the sources of great rivers of China, Indo-China, Siam, and Burma.

The table-land or high plateau has an elevation of 14,000 to 17,000 feet in the west and slopes very gradually to the east and south. Some important areas have not yet been visited, but explorers' routes seem to show that most of the surface is a mass of mountains and valleys, the elevations rising from 2000 to 3000 feet above the plain. A great many depressions contain lakes which are salt unless they are drained to other lakes, the entire hydrography being a system of closed basins.

The long east and west depression of south Tibet is still very high land, its ranges running parallel with the Himalaya and its fertile valleys containing most of the population of Tibet. The valley of the Sanpo is most important both for agriculture and transportation. In this southern part of the country are the seat of the government and the centres of culture and refinement; and far in the west of south Tibet, within a few days' march of one another, are the sources of three great rivers—the Brahmaputra, Sutlej, and Indus.

Eastern Tibet is a mass of ranges, partly covered with timber. It has more streams that rise in neighboring valleys, but reach different seas as great rivers, than any other part of the world. The mountains among which they rise have a larger rainfall than the plains to the west, for they are reached by moist winds from the Indian Ocean. Thus the headwaters of the Hoang, the Yangtse, the Mekong, and the Salwin rivers are already important streams before leaving Tibet. These highlands, 15 times more extensive than the Alps, are not so well known as the western plateau.

Climate. Owing to the dryness of the air, precipitation, either as rain or snow, is small except among the eastern ranges to which humid winds have access. The climate, however, is severe on account of the great elevation in latitudes corresponding with those of the Mississippi delta and Memphis. Explorers have found the winter cold, combined with deficiency of oxygen on the plateau, almost unendurable, and several of them have lost all their pack animals. The rarefaction of the air and the clearness of the sky give the rays of the summer sun full power and the hottest of days are often succeeded by night temperatures below freezing. The extremes of temperature are less in the partly wooded and lower levels of east and south Tibet.

Flora. Trees do not grow on the table-lands except in sheltered depressions, and then they are stunted. It has been settled that the flora, so far as the northern and eastern sections are concerned, belongs to the Arctic alpine division of the great northern region. In the south, the hot summer days, with irrigation, perfect a large variety of fruits and farm products. In the sheltered valleys of southeast and east Tibet are forests of timber still untouched.

Fauna. This includes the wild yak (*Poëphagus grunniens*), antelope, gazelle, kyang or wild ass (*Equus hemionus*), nyang or mountain sheep and goats (found above an elevation of 15,000 feet), wolf, fox, wild dog, bear (regarded by the natives with dread as the primitive speechless wild man and hence unmolested), musk deer, and hare. In game birds—especially in eastern Tibet—there are the sand grouse, several species of pheasant, ducks, teal, the bar-headed goose, coolen, etc. Among the domestic animals are the horse, sheep, cat, and dog, but no fowls. Song birds are not found, except as birds of passage.

Mineral Resources. Clay, slate, granite, quartz, and limestone are the chief materials forming the mountain ranges. The country is known to be extremely rich in minerals, and gold, silver, iron, and coal are prominent. Gold washing is a common occupation both in the east and west. In Thok Jolang, in the southwest part of the Chang-tang, Littledale found mining operations carried on six months of the year, exclusively by Lhasa people. Lapis lazuli and other semiprecious stones, as well as gems, are extensively used for personal adornment by both sexes, and it is supposed the country must be rich in these. The Kuen-lun Mountains have for many centuries been the chief source of the jade supplies of China.

Agriculture. Farming and the tending of flocks and herds are the chief occupations, but, owing to the elevated and rugged nature of the country, both are attended with many hardships. The Chang-tang (north plain) has some grass, but it is only at elevations less than 13,500 feet that the growing of barley—the hardiest of all the cereals, and the chief article of food in Tibet—becomes possible. The other crops are wheat, buckwheat, cabbages, potatoes, turnips, radishes, and pulse, and among the fruits, apples, apricots (especially in the western province), and peaches, and in the south pomegranates and jujubes. In much of the extreme south agriculture in the valleys is in a flourishing condition.

Industries. Tibet has no factories, but many minor industries are carried on in the settled districts, and the people are reputed to be skillful weavers, potters, and metal workers. Many women embroider artistically with gold thread and colored silks and manufacture large quantities of felt. An excellent kind of serge called *pulo* is produced everywhere.

Commerce. The chief products of Tibet are wool, lambskins, lynx, fox, leopard, and other skins, yak tails, used in India as chowries or flyflaps, deers' horns, musk, rhubarb, gold dust, precious stones, borax, nitre, salt, and live stock. Much of the wool (from goats) goes to Kashmir to be manufactured into Kashmir shawls. In exchange for these Tibet receives tea, cotton, and cotton goods, silk, sugar, and tobacco from both China and India; satins, gold brocades, red leather, chinaware, gun barrels, hardware, drugs, and flour from China; leather and saddles from Mongolia; broadcloth, indigo, spices, coral beads, and pearls from India; and rice from Sikkim. Owing to the failure of Tibet to keep Yatung, near the Indian frontier, open to trade, the Indian government sent an armed mission to Tibet in 1904 (the Younghusband expedition), which compelled the Tibetans to open Yatung, Gyangtse, and Gartok to British trade, and British agents are now established at those towns. The treaty signed by Tibet also provides that all forts between the Indian frontier and Gyangtse on routes traversed by merchants shall be destroyed and that no customs duties shall be imposed upon merchandise excepting those agreed upon by Great Britain and Tibet.

Transportation and Communication. Lhasa, the capital, is the great central mart, from which trade routes radiate in all directions. There are three highroads from Lhasa to the Chinese border and others to various points on the frontier of Mongolia, Bhutan, and India and through southern Tibet, from Lhasa to Gartok, 700 miles. Transportation is difficult and tedious, most of these journeys requiring months to complete. Robbers are numerous and bold, hence traders travel in large companies; the pack animals are yaks, mules, ponies, and, where the road is too stony for the yak, sheep are used, one sheep carrying 25 to 30 pounds. Food, fodder, and tents must be carried; the passes are precipitous and frequently blocked with snow. The animals are never housed by the way, and the mortality among them is very great. In the settled parts of the country the streams are usually bridged, or if unfordable they can be crossed in round wickerwork boats covered with skins, the animals swimming.

Government. At the present day the government of Tibet is in a very uncertain state, because the country claims independence of China, to which China does not agree, and because of the great increase of British influence over Tibetan affairs since the Younghusband expedition of 1904 and the Simla Conference of 1913–14. Before the present unrest the government was as follows: At the head stood the Dalai Lama, theoretically an absolute ruler, residing in the Potala or palace near Lhasa. Practically, however, his action was restrained to spiritual affairs, and he was represented in political matters by a regent, chosen for life by the Chinese government from among the chief lamas. This regent, in rank a step below the Dalai Lama, was supposed to be the most learned lama in the country. Then came four ministers of state, one of them a lama and the other three laymen. The one who had served longest was Prime Minister. Behind this machinery were two Ambans who represented Chinese authority and had charge of foreign and military affairs. Both the civil and religious duties were largely in the hands of Tibetans. There were courts of justice with two judges residing in Lhasa.

Population. Officially, the population of Tibet is given as 6,430,000, and by the Chinese Michengpu census of 1910 as 6,500,000, about 14 to the square mile. But these figures are far too high. Little estimates the number at about 1,000,000, and Père Richard at from 2,000,000 to 3,000,000. Rockhill estimates the population of central Tibet during the middle of last century at 1,500,000, and this same authority regards the present population of the entire area now known as Tibet as 3,500,000, which is no doubt near the truth. Many influences are at work to keep down the population, among which may be mentioned the absence of immigration, the prevalence of polyandry and of celibacy among the lamaists, and the great hardships of life among conditions that render the struggle for existence intense and incessant.

Religion. Bön, the indigenous religion of the country, is a kind of Shamanism (q.v.). It still has many adherents, especially in eastern Tibet; but the state religion, and the prevailing one, is the corrupt form of Buddhism called Lamaism (q.v.). There are several sects, but the most powerful is the Gelugpa, which constitutes the established church. (See TSONG-K'A-PA.) For the mass both of lamas and people religion is reduced to a system of magic in which worship has no object except to conjure the evil spirits. Followers of this sect wear yellow caps as distinct from the unreformed Nyingmepas, who wear red caps, and are the next most powerful sect. The lamas or monks are very numerous and dwell in great lamaseries, of which there are a great number. The largest is 7 miles west of Lhasa, and is known as the Dupon monastery. It is a city in itself and accommodates at present 7500 lamas. Here is the Great Oracle of State, operated by supposedly inspired lamas. Its influence is even greater than ancient Delphi. The Sera monastery at Lhasa has 5500 lamas, and the Gandan monastery about 2000. These 15,000 lamas practically control the country, and at times even the Dalai Lama and the Ambans are forced to give way to them. The power and richness of the monasteries increase yearly, and education is chiefly in their hands.

Ethnology. Judged by their language alone, Tibetans proper belong to the Tibeto-Indo-Chinese branch of Keane's *Homo Mongolicus*. Physically, however, they exhibit marked variations, there being present at least two types—one Mongoloid, the other a somewhat slender figure, thin, prominent, often aquiline nose, straight eyes, and long, sometimes wavy hair. In the permanently settled portions of the country, where centres of population have existed for centuries, the people have varied considerably from the original type, the result being a mixed race, becoming more Chinese as one goes towards China, or more Indian (Nepalese or Kashmiri) as one travels southward or westward. This mixture is in part due to the concubinage of native women with foreign traders, soldiers, pilgrims, officials, etc., and in part to the system of polyandry. Monogamy prevails among the nomads, but elsewhere polyandry is common, one woman becoming the wife of the brothers of a family, the oldest being considered the father of all the children, the others being regarded merely as uncles. There is also some polygamy among the wealthy, as in China.

History. The early history of Tibet is legendary and obscure. In the middle of the eighth century Tibet extended from Kuku Nor and Ladakh on the north into India in the south, while on the east the tribesmen came into frequent conflict with China, and it is recorded that they even entered Chang-an, the capital, in 763. In 747 the famous Indian wizard and teacher, Padma-sambhava, had arrived; he made a long missionary journey through the country, everywhere vanquishing the Shamanistic devils, and laid the foundation of Lamaism. In 749 the first monastery was built. Muni-tsanpo came to the throne in 789. In order to better the condition of the poor he compelled the rich to share their wealth with the indigent. This leveling process was unsuccessful. Lang-dharma, who died in 899, left only minor sons; the kingdom was broken up into two, later into a number of petty principalities, and it was easy for Genghis Khan to incorporate Tibet into his empire in 1206.

Kublai Khan, the conqueror of China, actively promoted the spread of Buddhism throughout the Mongol Empire. Buddhism having entered from India and China in the first half of the seventh century, the language was reduced to writing, the translation of the sacred books was begun, and about 650 the first temple—the Labrang, at Lhasa—was erected. From this time forth the internal history of Tibet is the history of the struggle of Buddhism (already corrupt) with the indigenous Shamanism (q.v.), the rise and development of Lamaism (q.v.) and the Lamaistic hierarchy, the abolition of the kingly dignity and the establishment of the supremacy of the Grand Lama at Lhasa as the head of both church and state. In 1270 he made the chief of the Sakya sect head of the church, and conferred on him the temporal power. Near the end of the fourteenth century arose Tsong-k'a-pa (q.v.), the great reformer, through whose efforts Lamaism was purified somewhat, and a new and powerful sect, the Gelugpa, was founded. In 1642 Kushri Khan, the Mongol Prince of Kuku Nor, conquered Tibet, and in 1645 made over the sovereignty of it to the Grand Lama of the time, with the title of Dalai (or Talé) Lama. He has continued ever since to be both the head of the state and the head of the church, the Chinese Empire having confirmed him in both offices in 1650. In 1717 the Sungars invaded the country, but were driven out by Chinese armies in 1720, when eastern Tibet was placed under the direct rule of Chinese officials at Kansu and Szechwan. In 1774 Warren Hastings sent from India an envoy to negotiate friendly commercial relations between Tibet and the British East India Company. Another embassy was sent under Turner in 1783, but his efforts were made futile by the policy of the company under the administration of Lord Cornwallis, who, under treaty engagements with Nepal, assisted the Gurkhas when in 1790 they invaded Tibet and plundered Tashilunpo. They were driven out in 1792 and the passes between India and Tibet remained virtually closed until 1903.

The latter years of the Manchu dynasty saw a steady decline in Chinese control over Tibet. The inability of the Peking government to establish order and security finally led to the sending of a mission with an escort (the Younghusband expedition) by the Indian government to Lhasa in 1904, in order to arrange matters directly with the Tibetan authorities. (See above.) These direct negotiations between India and Tibet led to a protest from the Chinese government, who demanded recognition as the suzerain of Tibet. The lengthy negotiations which followed resulted in the Anglo-Chinese convention of 1906, supplemented by a trade agreement in 1908. China, as the recognized sovereign power in Tibet, paid to the British an indemnity of 2,500,000 rupees, and Great Britain began to evacuate the Chumbi valley in February, 1908.

Great Britain next made a convention with Russia, Aug. 31, 1907, in which both high contracting parties agreed not to enter into negotiations with Tibet except through the Chinese government; nor was either power to send representatives to Lhasa.

The Chinese retained their hold on Tibet until the revolution of 1911. When it broke out the Chinese garrison at Lhasa mutinied in sympathy, but their lawless excesses against the inhabitants led to a revolt. They were besieged in Lhasa until August, 1912, when they were forced to retire, minus arms and ammunition, from Tibet by way of India. An expedition was immediately organized in China for the purpose of reconquering Tibet, and it would have been successful had not Great Britain protested that such expedition was a violation of the Anglo-Chinese treaty of 1906. China claimed the right to send troops into Tibet to restore order and to pacify the borderland, also to police and administer the country according to her suzerain rights. She disclaimed all intention to convert Tibet into a Chinese province. Great Britain, however, prevented the sending of the expedition and the consequent subjugation of the country by the Chinese.

By 1913 all Chinese troops had been driven out of Tibet, and the Tibetans claimed independence. An agreement to that effect was made, Jan. 11, 1913, with Mongolia. The Dalai Lama, as Sovereign of Tibet, approved of the formation of an independent state in Mongolia (Outer), which had also revolted from Chinese authority, while the Sovereign of Mongolia (the Hutukhta of Urga) likewise approved of Tibet as an independent state. Buddhism was to be established on a firm footing, and mutual assistance and protection (against China) was promised by one new state to the other.

An attempt to end the anomalous situation in Tibet and to establish its status was made by the Simla Conference, which met in October, 1913, with representatives from China, the Indian government, and the Dalai Lama. The conference resulted, April 27, 1914, in a provisional agreement of 11 articles and a later exchange of notes of seven articles. The following provisions were adopted: (1) For administrative purposes Tibet was to be divided into Outer and Inner Tibet, Inner Tibet being the region adjacent to China. (2) Tibet was to form part of Chinese territory, under Chinese suzerainty. (3) Outer Tibet was to be autonomous. Great Britain and China were to abstain from all interference with its administration. China was to agree that Outer Tibet would not be represented in any future Chinese parliament, and was not to send troops into the country, or establish any Chinese colonies or civil or military officers in that region. (4) A Chinese official was to be maintained at Lhasa, with an escort of 300 men. (5) The British agent at Gyangtse might visit Lhasa with an escort. (6) The trade regulations of 1893 and 1908 were to be cancelled. (7) Difficulties between the Chinese and Tibetan (Outer) governments arising out of this agreement were to be referred to Great Britain for adjudication.

The Chinese government at Peking repudiated the acts of its representative and refused to sign, although Great Britain and Tibet signed on July 3, 1914. China based her refusal on the fact that Chiamdo was included in Outer instead of Inner Tibet, and that Litang and Batang in Inner Tibet were in reality parts of Szechwan Province. Great Britain notified the Chinese government that, until the convention was signed, China would be deprived of all the rights and benefits accruing to her therefrom.

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TIBET, LITTLE. See BALTISTAN.

TIB'IA (Lat., shin bone). In anatomy, the larger of the two bones forming the leg, the other being the fibula. It articulates with the femur above and with the astragalus below.

The tibia was also the name of the commonest musical instrument of the Greeks and Romans. It was a pipe or flute, originally made of bone, but later of a reed, with the opening at the top, protected by a natural knot, with a tongue beneath, partially detached by a longitudinal slit. It was used at festivals, sacrifices, and dances, as an accompaniment to the rowing of the trireme, sometimes also to the march of troops to battle. The tibia dextra was the bass instrument and was held in the right hand, the tibia sinistra, or treble instrument, in the left. The tibiæ pares were both treble or both bass, and the tibiæ impares were one bass and one treble.

TIBUL'LUS, Albius (c.54–c.19 B.C.). A Roman elegiac poet, born of a noble family. He inherited an estate at Pedum, between Tibur and Præneste, which had been either wholly or partially confiscated in the civil wars. Tibullus, however, recovered part of his property, and spent there the best part of his life. He was patronized by Messala, whom in 31 he accompanied to Aquitania, to help suppress a serious revolt. He was present at the battle of Atax, a final blow to the insurgents; and he celebrates in a fine strain of poetry his honorable part in the campaign. Next year Messala was sent to the East, and again Tibullus accompanied him; but, having been obliged from illness to stop at Corcyra, he returned to Rome. Henceforth he devoted himself to poetry. His Elegies (four books) are mainly addressed to his mistresses, Delia, Nemesis, and Glycera. The third book is now believed to be the work, not of Tibullus, but of an inferior poet; while the hexameter poem on Messala (opening the fourth book) is also supposed to be by another. The character of Tibullus was pure, amiable, and winning. During life he had the honor of being addressed in an ode and an epistle by Horace; after death, of being bewailed in an elegy of matchless beauty by Ovid. The best editions are those of Baehrens (Leipzig, 1878), Hiller (ib., 1885), Müller (ib., 1885), Postgate (1906), and, with admirable Introduction and Commentary, by K. F. Smith (New York, 1913). The poems were translated into English by Grainger (1752) and Cranstoun (1872), into English prose by Kelly (1854), and into English verse by T. C. Williams (1905). Consult: W. Y. Sellar, *Horace and the Elegiac Poets* (Oxford, 1892); J. W. Duff, *A Literary History of Rome* (New York, 1909); W. S. Teuffel, *Geschichte der römischen Litteratur*, vol. ii (6th ed., Leipzig, 1910); Martin Schanz, *Geschichte der römischen Litteratur*, vol. ii, part i (3d ed., Munich, 1911).

TI'BUR. See Tivoli.

TIBUS. See Tibbus.

TICAO, tē-kä'ō. An island belonging to the Philippine Province of Masbate (q.v.).

TIC DOULOUREUX, tĭk dōō'lōō'rōō', *Fr. pron.* -rē. See Facial Neuralgia.

TICH'BORNE TRIAL. A celebrated trial in which an impostor attempted to obtain possession of the Tichborne estates in Hampshire and Dorsetshire, England, by assuming to be the heir, Roger Charles Tichborne. The case was remarkable for the interest it aroused, for the thoroughness of the trial, and for the impostor's success in deceiving many people. The real Roger Charles Tichborne was born in 1829, and after some education in France, and at the Roman Catholic College at Stonyhurst, England, entered the British army. His accent and eccentricities made him unpopular and he resigned and went to Brazil. In 1854 he sailed from Rio de Janeiro in the ship *Bella*, which was lost at sea with all on board. His father, Sir James Tichborne, died in 1862, and as Roger was supposed to be dead, a younger son, Alfred, became heir. Lady Tichborne refused to believe that her son Roger was dead, and advertised extensively for information regarding his whereabouts. In 1865 a butcher, Arthur Orton, who resided at Wagga Wagga, in New South Wales, under the name of Thomas Castro, conceived the idea of representing himself to be Roger Charles Tichborne and claiming the estates. He wrote a letter to Lady Tichborne claiming to be her son. The letter was illiterate and contained statements as to his identification which were wholly false and inapplicable to the true heir. He subsequently came to England, went over the Tichborne estates, gained all the information he could as to the former life and habits of Roger, and succeeded in convincing the family solicitor and others of his identity. In January, 1866, he called on Lady Tichborne in Paris and was received as her son. This was remarkable, as there was no similarity in the appearance of Orton and Roger Tichborne, and Orton had no knowledge of the French language, in which the true heir was proficient. After this recognition he had great success in gaining adherents, but the Tichborne family repudiated him, and investigated his life, discovering his true name and past career. He succeeded in raising large sums of money by issuing bonds, payable upon his obtaining possession of the property. These were widely distributed. He brought ejectment suits to recover the estates in 1871, and succeeded in inducing over 100 witnesses to swear that they recognized him or believed him to be Roger Tichborne. Despite his ignorance, he exhibited remarkable shrewdness and cunning at the trial, which lasted 103 days and ended in his being nonsuited. In 1873 he was tried for perjury, being defended by Edward Kenealy, and after a trial of 188 days was convicted, and sentenced to 14 years' penal servitude. He was released in 1884, and unsuccessfully attempted to stir up public sentiment in his favor. The cost of the two trials has been estimated at £200,000. Orton died in abject poverty in 1898. Consult *The Tichborne Romance* (Manchester, England, 1871) and *Charge of Lord Chief Justice of England in the Case of Queen vs. Thomas Castro* (London, 1874).

TICINO, tē-chē'nō. A river of Switzerland and north Italy (Map: Switzerland, C 3). It rises on the south slope of the St. Gotthard, flows in a general southerly course through Lago Maggiore, and empties into the Po after passing the city of Pavia. Its length is 154 miles. Its upper course is a wild mountain torrent flowing through romantic gorges, but below the lake it is navigable and communicates with several canals.

TICINO (Ger. *Tessin*). A southern canton of Switzerland, bordering on Italy. Area, 1088 square miles (Map: Switzerland, C 2). It has a very mountainous surface intersected by the valleys of the Ticino, Maggia, Moesa, and of a few other streams. In the north rise the Lepontine Alps with the St. Gotthard, in the east are the Adula Alps, while the south around Lago Maggiore is comparatively low, and is the most fertile part of the canton. Notwithstanding its mountainous character, Ticino has two-thirds of its area under cultivation. Cereals are the chief products, but southern fruits and grapes are also cultivated on a large scale. The manufacturing industries are undeveloped and native artisans emigrate annually to other parts of Europe. The chief means of transportation is the St. Gotthard Railway. The constitution (as amended in 1892 and 1904) provides for a Legislative Assembly elected by the people on the basis of proportional representation, and an Executive Council, also elected by the people. The optional referendum prevails. Pop., 1900, 138,638; 1910, 158,556, almost exclusively Italians. Capital, Bellinzona (q.v.).

Ticino as part of Gallia Cisalpina was early joined to the Roman Republic. After the decline of the Roman power it passed successively into the hands of the Ostrogoths, Lombards, and Franks. During the later mediæval period its territory formed a portion of the Duchy of Milan, from which it was wrested in successive conquests during the fifteenth and sixteenth centuries by the members of the Swiss Confederacy, whose title was confirmed by the Eternal Peace of 1516. The attempt to establish Protestantism in the District of Locarno was rigorously stamped out by the exile of members of that faith in 1555. The rule of the Italian district by the other members of the confederacy was harsh, but only one rebellion, in 1755, marked its course. In 1798 this district, divided into the cantons of Bellinzona and Lugano, was constituted part of the Helvetic Republic; in 1803 they were united into one canton—Ticino—which received greater privileges as a full member of the confederacy. Other difficulties were removed by the constitution of 1830, but measures of a religious and commercial nature have often separated the inhabitants from the sympathy of their northern neighbors, and local struggles of Radical and Ultramontane parties have often necessitated Federal interference. Consult Motta, *Bibliografia storica ticinese* (Zurich, 1887); Samuel Butler, *Alps and Sanctuaries of Piedmont and the Canton Ticino* (New York, 1913).

TICI'NUM. See PAVIA (second paragraph).

TICK (AS. *ticia*, miswritten for *tiica*, *tica*, Ger. *Zecke*, tick; connected with Armen. *tiz*, tick). One of those members of the order Acarina which belong to the families Argasidæ and Ixodidæ, which have been grouped together in the superfamily Ixodoidea. The ticks or louse flies are eight-legged creatures in which the cephalothorax is coalesced with the abdomen. The newly hatched individual is flat and nearly circular and has only six legs. With the first molt it enters the second or nymphal stage, which is characterized by the presence of a fourth pair of legs. After the second molt it becomes mature. In the free-living state the body of a mature tick is flattened dorsally and is of an oval shape. The body is covered with a leathery integument which generally assumes on the dorsal surface a hardened, chitinous, more or less smooth, and darker appearance. Near the margin it is impressed by a depressed line leaving a distinct rim around the body.

All ticks, so far as known, although found upon plants in their early stages, are parasites of animals. The young seek on every possible occasion to fasten themselves to vertebrate animals, usually mammals and birds, choosing spots where the skin is soft. When the young first fasten themselves they cannot penetrate deeply enough to draw blood, but the irritation causes a suppuration on which they feed. When they have grown sufficiently to enable them to reach a blood vessel, the small, flat, semitransparent creatures soon become distended, the body becomes rounded, and the color frequently becomes dark red. In a week or more the larva is transformed into the nymph, which at the expiration of another week is changed to a mature individual. Only the female sucks blood, so far as is known. The male retains its form and size, and although it attaches itself to warm-blooded animals, it evidently does so only to seek the female.

Several species occur in the United States. The common dog tick or wood tick (*Dermacentor electus*) is found frequently in the woods in the Northern States. The common tick occurring upon the ground squirrel in the Mississippi valley is *Ixodes ricinus*. *Argas miniatus* is destructive to chickens in parts of Texas and Florida, and *Argas reflexus*, the pigeon tick, is common in pigeon houses in Europe and the southern United States. This species is capable of living a great length of time without food. In Persia a species, the miana bug (*Argas persicus*), lives in houses and seeks human prey at night; its bite causes serious disturbance, and is said even to cause death. In South America a species known as garapate (*Amblyomma americanum*) occurs in dry, bushy places, where it clings to twigs and transfers itself to passing horses or cattle. It also lives in the United States and has been found on human beings. Eight species of ticks in the United States have been found upon cattle, one associated with the Texas cattle fever (*Boophilus annulatus*) being the most noted and most destructive. Other species of the same genus transmit the same or similar diseases of cattle in other parts of the world. *Boöphilus australis* transmits what is probably the same disease in Australia, and *Boöphilus decoloratus* (the so-called blue tick) acts the same way in South Africa, carrying the disease commonly known as red water. Texas cattle fever is particularly destructive to northern cattle that have been shipped south or that have been brought into contact with southern infested cattle shipped north. The dipping of cattle in vats containing cottonseed oil or any one of several mixtures, known as cattle dips, destroys the ticks.

Certain mites of the family Gamasidæ are sometimes known as ticks, although the name in this application is erroneous. The bird tick (*Dermanyssus avium*) is a familiar parasite of caged birds. The poultry tick (*Dermanyssus gallinæ*), also known as the little chicken mite, clings to fowls and sucks their blood. Certain of the true insects are also erroneously called ticks. For example, the flies of the family Hippoboscidæ are quite generally known as bird ticks. (See FOREST FLY; PUPIPARA.) The degraded wingless flies of the family Nycteribiidæ are called bat ticks.

Consult G. H. F. Nuttall and others, *Ticks: A Monograph of the Ixodoidea* (2 vols., New York, 1908–11), containing a bibliography, and W. A. Hooker and others, *Life History and Bionomics of some North American Ticks* (Washington, 1912). See also DOVE TICK; LOUSE FLY.

TICK'ELL, THOMAS (1686–1740). An English poet, born at Bridekirk, in Cumberland. He was educated at Queen's College, Oxford, of which he became fellow (1710–26). He attracted the attention of Addison by some lines praising the latter's *Rosamond;* and Addison, on becoming Secretary of State in 1717, made him Undersecretary. He was secretary to the

Lords Justices of Ireland from 1724 till his death. He published *Prospect of Peace* (1712), *The Royal Progress* (1714), and a poetical version of the first book of the *Iliad* (1715), out of which grew the famous quarrel between Pope (q.v.) and Addison (q.v.). His best-known poem is *Colin and Lucy;* the longest is *Kensington Gardens* (1722). Goldsmith calls his *Elegy on Addison* (prefixed to Addison's *Works*, 1721) one of the finest odes in our language. Consult Samuel Johnson, *Lives of the British Poets*, vol. ii (ed. by G. B. Hill, Oxford, 1905).

TICKER. See TELEGRAPH.

TICKET (OF. *estiquette, etiquette*, Fr. *étiquette*, ticket, label, etiquette, from OHG. *stehhan*, Ger. *stechen*, to stick). A slip of paper containing a statement or certificate that the person to whom it is issued, or the holder, is entitled to some right or privilege therein referred to or described, as railroad tickets, theatre tickets, pawn tickets, and lottery tickets. A ticket is evidence of a contract between the holder of the ticket and the person or corporation issuing it. Usually tickets do not purport to express the entire contract between the parties, and the terms or conditions which are not expressed may be supplied by parol evidence (q.v.). Where the ticket grants the right or privilege of using the grantor's real estate, as in case of theatre tickets, the holder of the ticket acquires no title or interest in the real estate, but becomes a mere licensee (see LICENSE) entitled to use the real estate in the manner and for the purposes specified. The licensor or grantor of the ticket, however, may at will revoke the license, even though such a revocation is a breach of the contract; and upon such revocation the holder of the ticket becomes a mere trespasser and may be summarily ejected, but only necessary force can lawfully be used for that purpose. He may, however, be entitled to recover damages for breach of the contract in ejecting him. This right of the theatre proprietor, however, is not an absolute one, to be exercised under all circumstances, and if the discrimination against a patron is for reasons of race, creed, or color a severe penalty will be imposed for each ejection or revocation of license. Furthermore, a license, evidenced by a ticket, may become irrevocable when coupled with an interest, as in cases where the licensee has an interest in the property or enterprise which is involved in the transaction. The courts of New York have held that an adverse critic may be excluded, inasmuch as his exclusion is not on the ground of discrimination for reasons of race, creed, or color. See THEATRE.

This rule does not apply in the case of tickets issued by common carriers, who, by virtue of their public calling, are compelled to accept for carriage all who pay a reasonable fare and comply with their reasonable rules and regulations. Passenger tickets under ordinary circumstances are generally now held to be contracts, and not mere symbols or means of identification of the passenger, so that the holder of a ticket is deemed to assent to its terms. Such stipulations, which usually restrict the liability of the carrier, have been held to be valid and binding if reasonable and not against public policy. Common carriers may require passengers to buy tickets as a condition of their being carried; and, when reasonable opportunity to do so is given, the carrier may charge an additional rate when the passenger has failed to buy a ticket. Common carriers may make any condition as to the time and use of tickets which is reasonable. Thus provisions contained in the ticket that it shall be used before a date named, or that it shall be stamped by the carrier before it is presented for a return trip, or that it shall not be transferable, have been held to be valid.

The carrier may require the passenger to produce the ticket or an identification check for inspection whenever requested to do so, and upon the passenger's failure to comply with the regulation may eject him. This appears to be the general rule even when the passenger's inability to comply with the regulation is due to the neglect of the carrier's agents, as when the wrong ticket is given out by the carrier's ticket agent or the wrong coupon is taken up by one conductor, so that the passenger is left without the proper coupon at a subsequent stage of his journey. The passenger's right in such a case is not to insist upon being carried without payment of the fare demanded by the conductor or other agent of the carrier, but to pay the fare demanded and to bring an action against the carrier for breach of the contract evidenced by the ticket. Purchase of a ticket entitles the holder to all the accommodations usually given by the carrier to holders of that class of tickets. If, however, they are not provided, as in case the carrier fails without excuse to provide the passenger with a seat, his right is not to refuse to pay fare or surrender his ticket, but to recover damages for the carrier's breach of contract or undertaking to carry. Where the passenger is riding on a free pass the duty of the carrier towards him is the same as that owing to a trespasser, viz., to refrain from wanton or willful injury. See CARRIER, COMMON; TRANSPORTATION; ETC.

TICKET OF LEAVE. In Great Britain and its Australian colonies, a kind of permit or license granting a prisoner his liberty for good conduct, and revocable for subsequent misconduct, under the terms of its conditions. The term was first applied to the license of liberty granted to convicts in Van Diemen's Land as a part of the reform in prison methods in 1840, and later to those who were granted a similar license in England as a partial compensation for their long term of imprisonment after transportation had been discontinued, but the terms of sentence had not been shortened. These convicts became so numerous, and the number of crimes committed by them became so serious, that a still further reform led to the system of granting the license upon the mark system, under which it was given only to convicts sentenced for terms longer than two years, who by their work and industry, as shown by their marks, became entitled to it. Under this system the ticket of leave has been found to work well, its chief defect being the drawback put upon the prisoner's chance of success in obtaining work and living among reputable people by his liability to constant surveillance by the police officials. This defect is largely removed by the existence of various private charitable institutions which look after the prisoners who place themselves under their charge in such a manner as to remove the publicity of their being watched. The prisoner is practically free to come and go as he chooses within a certain district, under certain conditions of living an honest, industrious life among honest people, and making periodical reports.

The effectiveness of such a system of rewarding good conduct on the part of prisoners, and inducing them to live honest lives without imprisonment, but yet where their conduct is subject to control, has become so generally recognized that similar acts have been passed in many of the United States, the license being generally called a parole. Most of these acts have been passed since 1890, and under none of them can a parole be granted to a person convicted of murder in either the first or second degree; and most of them refuse it to a prisoner serving under a second conviction of crime.

Consult PENOLOGY, and works referred to there; PRISONS.

TICK FEVER. See SPOTTED FEVER.

TICKLING. See CUTANEOUS SENSATIONS; LAUGHTER.

TICK'NOR, FRANCIS ORRERY (1822–74). An American poet, born in Baldwin Co., Ga. He studied medicine in the North and practiced his profession at Columbus, Ga. A small volume of miscellaneous verses—*Poems*, with a memoir, by Paul H. Hayne—was published in 1879. Two poems of Ticknor's are well known and rank among the best lyrics produced in the South. They are the pathetic "Little Giffen" and the stirring "Virginians of the Valley." His *Poems*, edited and collected by M. C. Ticknor, appeared in New York in 1911.

TICKNOR, GEORGE (1791–1871). An American literary critic and historian, born in Boston. Educated in a scholarly home, a graduate of Dartmouth (1807), admitted to the Boston bar in 1813, he gave up the legal profession for literature, went to Europe in 1815, studied four years at Göttingen and in other continental cities, and returned in 1819 with a valuable library to a professorship of modern languages and literature in Harvard College. Here he devoted himself especially to French and Spanish, attracting many beyond the university circle. He resigned his professorship in 1835, passed three years in Europe and 11 more years in elaborating his greatest work, *History of Spanish Literature* (1849), which was translated into German and Spanish and came to be regarded as a standard work even in Spain. It was reissued in 1854, and again reëdited and enlarged in 1863. A fourth edition embodies his latest revisions. He published also a *Life of William Hickling Prescott* (1864) and several minor works. His *Life, Letters, and Journals* are collected in two volumes (1876). Other letters describing his life as a German student may be found in W. P. Trent's *English Culture in Virginia* (Johns Hopkins University Studies). His library, containing one of the best collections of Spanish literature in existence, was bequeathed to the Boston Public Library. As an educator Ticknor was in advance of his generation; as a citizen he represented the best traditions of Boston; as a scholar he held his own with the erudite men of his day, but his greatest work is now losing its prestige.

TICKNOR, WILLIAM DAVIS (1810–64). An American publisher, born at Lebanon, N. H. He helped to found at Boston in 1832 the publishing firm of Allen and Ticknor, succeeding to the business of Carter and Hendee. His partner retiring the next year, Ticknor carried on the business alone for some six or seven years, and then John Reed and James T. Fields (q.v.), the latter formerly in the employ of Carter and Hendee, joined him. For about 10 years after 1854, when Reed withdrew, the firm name read Ticknor and Fields. Ticknor and Fields became the publishers of the *Atlantic Monthly* and the *North American Review*. Their office, in the "Old Corner Book Store" building (still standing in 1916), was a gathering place for the leading literary men of the time. They were among the first American publishers to make payments for editions of English and other foreign authors, beginning with £100 to Tennyson in 1842.

TICON'DERO'GA. A village in Essex Co., N. Y., 100 miles north by east of Albany, on the creek which conveys the waters of Lake George into Lake Champlain, and on the Delaware and Hudson and the Rutland railroads (Map: New York, G 3). It is rich in reminiscences of Colonial and Revolutionary periods. The vicinity is noted for its extensive production of crystalline graphite, furnishing the greater part of the total output of the United States. The water power afforded by the falls is utilized by several industrial establishments. Paper, wood pulp, and lumber products constitute the leading manufactures. Pop., 1900, 1911; 1910, 2475; 1915 (State census), 2918.

In 1755 the French, recognizing the strategic value of the promontory, built a fort here and called it Fort Carillon (chime of bells), in allusion to the pleasing sound of the waterfalls near by. Several years later the present name was adopted. In 1757 Montcalm assembled here a force of 9000 men, with which he took Fort William Henry, on Lake George. On July 8, 1758, General Abercromby, with 15,000 men, stormed Fort Carillon, but was repulsed with a loss of 2000, Viscount George A. Howe being among the killed. In 1759 General Amherst with a force of 12,000 men invested it, and the French being too weak to withstand an attack, dismantled and abandoned both this fort and Crown Point, which were then enlarged and strengthened by the English. Being weakly garrisoned after the cession of Canada to Great Britain, Ticonderoga was surprised and captured on May 10, 1775, by Ethan Allen. On June 30, 1777, Burgoyne invested it, and on July 5, by placing a battery on Mount Defiance, a higher point, then called Sugar Loaf Hill, he forced the garrison to evacuate the place. Later in the year General Lincoln attacked the British here and captured Mount Defiance, releasing 100 American prisoners and taking 293 of the English, but he failed to recover the fort itself. After Burgoyne surrendered at Saratoga, the English garrison was removed and the fort dismantled, though in 1780 another English force under General Haldimand was stationed here. The fort has gradually fallen in ruins. Consult W. C. Watson, *Military and Civil History of the County of Essex, New York* (Albany, 1869), and L. E. Chittenden, "The Capture of Ticonderoga," in Vermont Historical Society, *Proceedings* (Montpelier, 1872).

TIC-POLONGA. See DABOIA and Colored Plate under SNAKE.

TICUNA, tē-kōō'nȧ, or TUCUNA. A wild tribe of uncertain affinity inhabiting the forests of the Upper Amazon (Marañon) about the confluence of the Javary, on the Brazil-Peru frontier. They go naked, excepting for necklaces of monkey teeth and armlets of feathers, and depend for a living upon hunting and fishing.

Physically they are well formed, and rather slender, with dark complexion and mild expression. In disposition they are honest and direct. They bury their dead in great earthen jars, with their face turned towards the rising sun, and weapons and fruit placed upon the bosom. They have interesting masked dances and an operation allied to circumcision is practiced on infants at the time of assigning them names. Jesuit missions were established between 1683 and 1727. Consult K. F. P. von Martius, *Ethnographie und Sprachenkunde Brasiliens*, vol. i (Erlangen, 1863), and A. F. Chamberlain in *Journal de la Société des Américanistes de Paris*, new series, vol. vii (Paris, 1910).

TIDAL (Heb. *Tid'al*). A king of Goiim, who, according to Gen. xiv. 1, accompanied Chedorlaomer of Elam, Amraphel of Shinar, and Arioch of Ellasar in an expedition against Palestine. Goiim is supposed by many scholars to be a clerical error for Gutim. Tidal would then be a ruler of Gutium (see ARRAPACHITIS; ARPACHSHAD), like Amraphel subject to the suzerainty of Elam. Amraphel is, no doubt, identical with Hammurapi (2141–2081 B.C.), and the passage referring to Tidal in Gen. xiv may have been drawn from a cuneiform account. The name *Tudḫul*, which may have been rendered Tid'al, occurs in a late cuneiform inscription, as the son of Gannazi; but the mutilated text does not permit any definite conclusion. See CHEDORLAOMER.

TIDAL WAVE. A term erroneously applied to almost any unexpected wave that inundates the seacoast or the shore of a great lake. These waves are rarely, if ever, due to the tides, since the tidal wave is a phenomenon admitting of exact calculation and prediction; on the other hand, they may usually be traced to some distant earthquake or violent storm. The Messina earthquake of 1908 which had its origin in the narrow strait between Sicily and the Italian coast set up sea waves which reached a height of 35 or 40 feet and were responsible for much damage. The Galveston floods of 1900 and 1915 were caused by the piling up of the waters driven in by West Indian hurricanes. See EARTHQUAKE; INUNDATION.

TIDE (AS. *tid*, OHG. *zit*, Ger. *Zeit*, time; connected with Skt. *a-diti*, boundless, and ultimately with Eng. *time*). The daily rising and falling of the waters of the ocean. When the water has reached the highest point it is called high water, and at its lowest point low water. The rising of the water is called flood, the falling ebb. Tides are caused by the gravitational attraction or pull of the sun and moon upon the water, and upon the earth itself. The moon, being so much nearer than the sun, is of course the principal cause. When the moon is directly over a given place it pulls the water under it, and thus tends to heap up a tidal wave just under the moon. At the same time it is pulling the earth itself; but it pulls the water more than the earth underneath, simply because the moon is nearer to the water on the surface than it is to the solid earth behind it. For we must remember that, according to Newton's law of attraction, the pull decreases rapidly when the body pulled is removed to a greater distance. But this reason also makes the attraction exerted upon the solid earth greater than that affecting the mass of water upon the side of the earth remote from the moon. This water, being still farther away than is the solid earth, gets the least pull of all. The earth is, so to speak, pulled away from that part of the ocean. This causes another distinct heaping up of water on the farther side of the earth giving us a second tidal wave. There should be, therefore, two lunar tidal-wave crests, one directly under the moon and the other on the side of the earth diametrically opposite. At these points it will be high water, while along the circle of the earth distant 90° from the sublunar point it will be low water. In the same way, the sun gives rise to two tidal-wave crests which, however, are not so pronounced as those due to the moon, since, on account of the greater distance of the former body and notwithstanding its enormously greater mass, its tide-raising force is only about $\frac{4}{9}$ of that of the moon. The actual tide, then, will be that due to the added effects of the solar and lunar tide-raising forces, which result in a tidal wave with two crests that are at times a little in advance, at others a little behind, the positions of the crests due to the moon alone, depending on the relative positions of the sun and moon. The double tidal wave explains why there are two high tides and two low tides every 24 hours; actually the average period is 24 hours 51 minutes, since, owing to the eastward motion of the moon, it comes to the meridian later each day, the average daily retardation being 51 minutes. At new and full moon, the earth, sun, and moon are in a direct line with one another, and consequently the crests of the solar and lunar tidal waves will then coincide, and we shall have high water higher, and low water lower, than the average; these are the spring tides. On the other hand, at first and third quarters, the moon is at right angles to the sun as seen from the earth, and the crests of the lunar tide coincide with the troughs of the solar tide, with the result that high water is lower, and low water higher, than the average; these are the neap tides. The heights of spring and neap tides are very nearly in the ratio of 13 to 5. Both tides are most marked about January when the sun is nearest the earth and therefore its tide-raising force is greatest whether acting with or against that of the moon. Between new moon and first quarter, and also between full moon and last quarter, the crest of the solar tide is in advance of that of the lunar tide, and consequently high water occurs a little before the time at which it would be due were the moon the only tide-raising body concerned; and the tides are then said to prime. On the other hand, between first quarter and full moon, and between last quarter and new moon, high water is later in arriving, and the tides are said to lag. The foregoing explanation is called the equilibrium theory of the tides. It is very plausible, but unfortunately it fails to agree with observed facts, though it is nevertheless of great use in leading up to a better theory. Under the equilibrium theory we should expect high water at any place about the time when the moon, as astronomers say, passes the meridian. This time might be modified by the solar effects, as we have seen, but only to a trifling amount which can be easily calculated. Unfortunately, this theory is not in accord with observation. There are places where the high water comes as much as six hours away from the meridian passage of the moon. In other words, the equilibrium theory is at times in error by the maximum possible amount. The trouble is that it tells us what would happen if the forces governing the tides had plenty of time to act. But the turning of the earth on its axis continually presents a new meridian to the moon, so that the tidal-wave crest is always following the moon, ever trying to be highest directly under it. Thus what should occur under the equilibrium theory is greatly modified by the theory of the motion of fluid waves. This leads then to the dynamical theory of the tides.

A consideration of the subject is much simplified by assuming a condition of things that does not really exist in nature. Let us imagine a canal full of water encircling the earth at the equator. Sir Isaac Newton was the first to investigate what would happen to a wave set in motion in such a canal. It can be shown mathematically that the speed at which such a wave would travel depends simply on the depth of the canal. The deeper the canal, the greater the speed of the wave. This is, of course, very important, and shows what a perfectly free wave would do under such simplified conditions. It can even be computed that if the canal were 13¾ miles deep, the wave would travel round the earth in exactly twenty-four hours. Now, it is the tendency of the sun and moon to set such a free wave in motion at each instant of time; and these go on traveling along more or less like the supposed simple wave in the canal. If the ocean were 13¾ miles deep, the waves would have a period of one day; and the new free waves forming all the time would reinforce the old ones, leading to an enormous tidal accumulation. Fortunately, the ocean is much less than 13¾ miles deep, and the waves travel much more slowly than once a day. It may happen, therefore, that as the waves travel around the earth, their speed may be such that we shall find a wave hollow instead of a wave crest under the moon. Thus, the modification of the equilibrium theory by the wave motion may at times completely reverse things, giving us low tide when we should expect high tide.

We may carry the canal idea a step further, with a remarkably interesting result. Suppose the whole surface of the earth were covered with a series of canals parallel to the equatorial canal. Then, as we approach the pole, the canals will be shorter, since the equatorial circumference of the earth is longer than it is in any other latitude. Thus the waves in high latitudes would not have so far to go as the waves in the low latitudes, and so might tend to reinforce each other as explained above. So we might have inverted tides in the equatorial regions and direct ones in the polar regions; and in some intermediate latitude there would be, as Darwin says, "very great tides, the nature of which cannot be specified exactly." This would occur, as we have seen, where the earth's circumference is short enough to permit a free wave to go all around in about 24 hours. These dynamical considerations of wave motion in canals lead to results bearing some sort of resemblance to the actual observed phenomena of nature. It should be noted, of course, that the foregoing considerations refer to theoretical conditions such as would exist if the earth were simply covered with a layer of water. But the actual facts of nature are so different that they modify very greatly the theoretical tidal action of the sun and moon. So large a part of the terrestrial surface is covered by land that the free motion of tidal waves is seriously impeded. It is therefore impossible to predict the times of high water accurately from theoretical considerations alone. Fortunately, the practical prediction of the time of high water for any place can be effected by analyzing a long series of tidal observations made at the place in question. This method of procedure has been in use for many years, and we now possess tidal tables for all principal seaports accurate enough for navigation.

A modification of ordinary tides occurs in rivers. Here the tidal rise appears of course as a strong current running up-stream, where the ocean level outside the river-mouth has been raised. At times this tidal current advances with a high and dangerous wave crest (called a bore), and it may acquire velocity enough to raise the water level in the river considerably above that of the ocean outside. These phenomena, and indeed all tidal phenomena, are partly modified by the configuration of the coast line and the depth of water. (See HYDROGRAPHY.) Consult: Sir R. S. Ball, *Time and Tide* (London, 1892); G. H. Darwin, *Tides and Kindred Phenomena in the Solar System* (Boston, 1898); William Dampier, in *Voyages* (2 vols., ib., 1906); W. H. Wheeler, *Practical Manual of Tides and Waves* (ib., 1906); W. B. Dawson, *Methods of Investigation of Tides and Currents* (Ottawa, 1911); W. H. Hunter, *Rivers and Estuaries, or Streams and Tides* (New York, 1913).

TIDEMAND, tē'dâ-mân, ADOLF (1814–76). A Norwegian genre painter, born at Mandal. He studied at the Academy of Copenhagen and under Hildebrandt and Schadow at Düsseldorf, whence he went to Munich and later to Rome. Afterward he usually spent the summer in Norway and the winter in Düsseldorf. Besides large historical compositions, he painted chiefly genre scenes illustrating Norwegian peasant life, which he depicted, in the manner of the Düsseldorf school, from the idyllic and romantic rather than the pictorial side. Such are: "Devotional Meeting of the Haugianers" (gold medal, 1848, Christiania and Düsseldorf galleries); a cycle of 10 pictures (1850, Château of Oscarshall, near Christiania); "Summer Evening on a Lake" (1851, National Gallery, Berlin).

TIDE WATERS. The legal term for waters subject to the ebb and flow of the tide. Formerly the term was synonymous with navigable waters. The modern development of waterways and commerce has made many nontidal waters, such as canals, lakes, and rivers, navigable, and the terms are now interchangeable. Navigable means for the ordinary modes of travel or trade. The fact that a body of water or stream is not navigable throughout, or that it is only periodically navigable, is immaterial. Nor does it mean water that is used for pleasure alone, such as shallow streams or marshes, where a row boat may be floated. The legal questions arising concern first the water, and second, the shore and land under water. Under the first heading are questions relating to navigation and fishing, and under the second, ownership of the shore, pier rights, and oystering. Because they are navigable such waters, in the same way as highways, are considered public property. In England the common law theory was that such waters, land thereunder, and land between high and low watermark, belonged to the crown. Following that theory the separate States in the United States have ownership, but under the powers delegated to it by the Constitution the Federal government regulates foreign and interstate commerce, and exercises supervision over interstate waterways, also in regard to irrigation. (See WATER RIGHTS.) Before their admission as States the title to tidal waters and land within Territories is in the Federal government. The question of control over boundary waters often arises between States, both foreign and in the United States, but is usually settled by conventions. (See TERRITORIAL WATERS.) Navigable waters may not be obstructed in any manner which would interfere with navigation or use by the public. They may be privately owned, such as canals and small lakes, but they are subject to the supervision of the State. Any obstruction may be removed as a nuisance. Bridges may be placed over tidal or navigable waters, but they must be built in such a manner—either with draws or of sufficient height—as not to prevent ordinary transportation on the water beneath. A grant to a railroad to erect a causeway without adequate provision in this regard would be considered illegal. The right of fishing on tidal waters is a public right, on the theory that such waters belong to the State. It is usually supervised by commissions or officials.

In regard to the shore and land under water the public has no right to the use of the banks of a stream, and on the seashore no right of landing except where the shore is connected with a public highway. It has, however, the right of passage over lands between high and low watermark. The famous Cliff Walk at Newport, R. I., is an illustration of this principle—the public having the right of passage over the shore when the tide is out, the owners of the upland have found it more convenient to provide a fixed walk. Frequently grants are made by the State to municipalities, as in the case of New York City, and at times to individuals. By early statute in Maine, Massachusetts, New Hampshire, and Virginia, title to land between high and low water was granted to the owners of the upland, and in all States such grants must be authorized by special statute. In isolated instances rights have been acquired by use and prescription.

The ownership and use of the banks of a stream and of the shore involve questions of riparian rights (q.v.). Broadly it may be stated that while on nontidal waters the rights of the littoral owners to the centre of lake or streams are absolute, on navigable waters they are limited. The littoral owner has the right of access to the point of navigation, i.e., he may build a pier or wharf to the navigable part of the water, but he must not in any way interfere with navigation nor with his adjacent neighbor. Land under water belongs usually to the State, but title thereto may be given by special grant where the owner of the shore intends filling in, or for bulkheads or wharves. Special grants are in existence of the bottoms of bays or lakes independent of ownership of the upland, the right, e.g., of oystering on the bottom being absolute while the right of the public to navigation on the surface remains. Consult Gould, *Law of Waters* (Chicago, 1900). See HIGH SEAS; MARE CLAUSUM.

TIDORE, tē-dō'rā. A small island of the Molucca Archipelago, off the west coast of Gilolo, a few miles south of Ternate (q.v.). It is important as the seat of the Sultan of Tidore, who, under Dutch supervision, resides at Soa Sia and exercises authority over parts of New Guinea and neighboring islands. Pop., about 10,000, consisting mainly of Mohammedans. See MOLUCCAS.

TIE. In music, an arch drawn over two notes on the same degree, uniting them so that they are played or sung as one single note of the same value. See SYNCOPATION.

TIECK, tēk, CHRISTIAN FRIEDRICH (1776-1851). A German sculptor. He was born in Berlin and studied there under Schadow, and later under David d'Angers in Paris. In 1801-05 he was employed at Weimar, where he was associated with Goethe, and modeled his bust. After a sojourn in Italy, Switzerland, and Munich, where he made numerous busts, including those of Prince Ludwig of Bavaria, Schelling, Humboldt, and his brother, Ludwig Tieck, he returned in 1819 to Berlin, and in 1820 was made professor at the academy. His chief works in Berlin are a mythological relief for the Royal Theatre, the bronze group of "Horse Tamers" on the roof of the Berlin Museum, and a statue of Schinkel in the corridor. Tieck's style remained thoroughly classical, unaffected by the naturalism of his contemporary Rauch.

TIECK, LUDWIG (1773-1853). A German romantic novelist, translator, and critic, brother of the preceding, born in Berlin. After studies at Halle, Göttingen, and Erlangen and four years of literary work in Berlin, Tieck went to Jena in 1799 and joined the Schlegels and Novalis in their romantic agitation. Leaving Jena, he went to Dresden, moved to Ziebingen near Frankfort on the Oder, visited Italy (1805), England and France (1817), and in 1825 became director of the Dresden Court Theatre after having since 1819 been the centre of a literary circle there. Royal favor brought him in 1841 back to Berlin, where his dramatic talents were used in the production of several Greek plays. Tieck's significant literary career opens with *Abdallah* (1795), *Sternbalds Wanderungen* (1798), and *William Lovell* (1795-96), the last a novel of "storm and stress." His youthful imagination ran riot also in mediæval legends and fairy tales, e.g., the three volumes of *Volksmärchen* (1797), among which were versions of *Puss in Boots* and *Bluebeard.* A comedy, *The World Topsy-Turvy* (1799), *Die verkehrte Welt,* proclaimed even more emphatically his period of romantic revolt. To this year belongs also the ultraromantic work written in collaboration with Wackenroder, *Phantasien über die Kunst,* full of enthusiasm and of a mystic religiosity. His *Romantische Dichtungen* (2 vols., 1799 and 1800) were the first work to show the direct influence of association with the Schlegels. They were followed by an admirable translation of *Don Quixote* (1799-1801) and by *Kaiser Octavianus* (1804), which he published as a *Lustspiel.* This period of rapid production was succeeded by an attack of the gout. His subsequent work is less mystic, less erratic, more artistic, e.g., *Phantasus* (1812-17), but Tieck did not reach his mature style till his visit to England, the direct results of which are *Shakespeares Vorschule* (1823-29), *Dramaturgische Blätter* (1826), and the noble continuation of Schlegel's translation of Shakespeare, of which he was the moving spirit, although his daughter, Dorothea, and Count Baudissin did the actual work. Indirectly the same influence is seen in the *Novellenkranz* (1831–35; 12 vols., 1853). Tieck's *Works* are in 28 volumes (1828–54); select works edited by Witkowski (4 vols., Leipzig, 1903) and by Bernd (2 vols., Berlin, 1908). Some tales and novels are translated by Carlyle, by Thirlwall, and others. Consult the German studies by Köpke (Leipzig, 1855) and Friesen (Vienna, 1871). Carlyle's *Essay on Tieck* was published in 1827 and introduced him to English readers.

TIEDEMANN, tē'de-män, Friedrich (1781–1861). A German anatomist and physiologist. Born and educated at Marburg, the son of the philologist Dietrich Tiedemann (1748–1803), he studied medicine at Marburg, Würzburg, and Paris, and became professor of anatomy and zoölogy at Landshut (1806) and professor of anatomy and physiology at Heidelberg (1816), resigning from the latter office in 1849. He became known as one of the leaders in his profession. Tiedemann's later years were spent at Frankfort-on-Main and Munich. Among his many works are: *Anatomie des Fischherzens* (1809); *Anatomie der kopflosen Missgeburten* (1813); *Anatomie and Bildungsgeschichte des Gehirns* (1816); *Physiologie des Menschen* (1830–36); *Geschichte des Tabaks* (1854).

TIEDGE, tēt'ge, Christoph August (1752–1841). A German poet, born at Gardelegen, Prussian Saxony. After studying jurisprudence at Halle, he was secretary and tutor at Magdeburg, Ellrich, and Halberstadt, and in 1799 settled in Berlin. There he met the celebrated Elisa von der Recke, whom he accompanied on a journey to Italy in 1804–06, remaining afterward her faithful companion, first in Berlin and from 1819 on at Dresden, where, placed beyond material care by his friend's last will, he continued to live until death. Some lyrics, of which "Schöne Minka, ich muss scheiden" is still unforgotten, first established his reputation, and *Urania über Gott, Unsterblichkeit und Freiheit* (1800; 18th ed., 1862), a lyric-didactic poem, inspired by the ethics of Kant, enjoyed wide popularity in its day. A kind of sequel to it were the *Wanderungen durch den Markt des Lebens* (1833). Among his other poetical efforts, the *Elegien und vermischte Gedichte* (1803) met with the greatest success. After his death the Tiedge Foundation was established (1842) in Dresden for the purpose of caring for the poet's grave and of granting subventions to poets and artists or their widows and children. Administered by the Saxon Ministry of Public Instruction, its funds amounted to more than 662,000 marks, in 1901. Consult: Falkenstein, *Tiedges Leben und poetischer Nachlass* (Leipzig, 1841); Eberhard, *Blicke in Tiedges und Elisas Leben* (Berlin, 1844); and Kern, *Beiträge zu einer Charakteristik des Dichters Tiedge* (ib., 1896).

TIEFFENBRUCKER, tē'fen-bru̇k'ẽr. See Duiffopruggar, Caspar.

TIEGHEM, Philippe Edouard Léon. See Van Tieghem, P. E. L.

TIEL, tēl. A town in the Netherlands, Province of Gelderland, situated on the right bank of the Waal, 19 miles west of Nimeguen (Map: Netherlands, D 3). The town possesses the beautiful church of St. Mary, the church of St. Martin, dating probably from the twelfth century, and a communal college. Tiel was an important commercial centre as early as 972, when it received municipal privileges from the Emperor Otho I. It is the principal trading place of the Neuse-Waal district. It manufactures mustard, madder, furniture, and tobacco. Pop., 1909, 10,654.

TIELE, tē'le, Cornelis Petrus (1830–1902). A Dutch theologian. He was born near Leyden, and studied at Leyden and Amsterdam. He then entered the ministry, being connected with the Remonstrant or Radical sect of the Evangelical church, and served churches at Moordrecht and Rotterdam (1853–72). Meanwhile he continued his theological studies and published a valuable work on Zoroastrianism, *De Godsdienst van Zarathustra* (1864). In 1866 he began with Kuenen the editing of the *Theologisch Tijdschrift* which at once became one of the leading continental reviews. In 1872 he published a *Comparative History of Egyptian and Semitic Religions*. In 1873 he became professor of theology at the Remonstrant Seminary at Leyden, and while there published a *Manual of the History of Religions* (1876), which at once took a leading place in the literature of the subject (Eng. trans., 1877). In 1877 Tiele became professor in the newly founded chair of the history and philosophy of religion at the University of Leyden, from which he retired in 1901. In 1886–88 he published *Babylonisch-assyrische Geschichte*. In 1893 he began the publication of a monumental work on *The History of Religions Down to the Days of Alexander the Great* (translated into German, *Geschichte der Religion im Alterthum*, Gotha, 1895). In 1896–97 he gave two courses of lectures at Edinburgh on the Gifford Foundation, published as *The Elements of the Science of Religion* (1897–99), and also in Holland and Germany. Consult *The Study of Religion* (New York, 1902), and L. H. Jordan, *Comparative Religion* (ib., 1905).

TIENEN, tē'nen. A town of Belgium. See Tirlemont.

TIENTSIN, tyĕn'tsĭn'; properly **T'IENTSIN** (Heaven's Ford). A city and treaty port of Province of Chihli, China, situated on the eastern edge of the Great Plain, on the right bank of the Pei-ho (Map: China, L 4). It is at the junction of the Pei-ho with the Grand Canal, which, prior to the silting of the canal, afforded easy inland communication with many of the great cities of the country and bore to Tientsin the great fleets of junks engaged in the transportation from the south of the tribute-rice for the provisioning of Peking. It is 70 miles by water from the sea, and about 70 southeast of Peking. It is in rail communication with Peking, the Kaiping coal mines, Shanhai-kwan, and Manchuria, and with Paotingfu, and thence southward through Chingting with Hankow. The city, which was only a wei or military station until 1782, is comparatively small. Its walls of brick and stone are 30 feet high, nearly 4 miles in circuit, and pierced with four gates surmounted with towers. The houses are generally of brick or pressed mud, and only one story high. Like those of most Chinese cities, the streets are filthy and ill-kept. The suburbs are very large, and in them is carried on most of the trade. Pop., about 800,000. In 1860 Tientsin was opened by treaty to foreign residence and trade. The foreign settlement—known as Tsuchulin, or Red Bamboo Grove—is also situated on the right bank of the river and about 1½ miles below the city, but within the line of circumvallation known as San-ko-lin-sin's Folly. (See SENG-KO-LIN-SIN.) It is laid out in foreign style, has a jetty or pier and a fine esplanade along the river bank, well-kept streets, fine dwellings and warehouses, gas, electric lights, and many good public buildings, such as the customhouse and the town hall, known as Gordon Hall. There are schools, hospitals, clubhouses, and the naval school established by Li Hung Chang, and within a short distance are two well-equipped arsenals. The government of the settlement is vested in a municipal council elected by and composed of the land renters.

Tientsin has no factories. Its principal manufactures are straw braid and samshu, and cured skins and tobacco. There is an immense trade in salt.

The customs collections at Tientsin for 1913 were second highest of all Chinese ports and amounted to $3,253,966. Direct foreign imports in 1913 equaled $38,053,534, and foreign imports from Chinese ports to Tientsin, $15,018,603, a total of $53,072,227. The net value of native Chinese goods imported into Tientsin in 1913 was $18,424,399. Exports reached a total of $28,031,010. Foreign goods sent inland from Tientsin amounted to $27,700,000. Shipping consisted of 1001 steamers entering with total tonnage of 1,247,767, and clearances of 998 steamers with tonnage of 1,244,188. The principal imports are woolens, drills, sheetings, shirtings, jeans, twills, seaweed, sugar, rice, grain, kerosene oil, tea, opium, cigarettes, paper, munitions of war, steel, and salt (the last is a government monopoly). The articles of export are samshu, straw braid, furs, goatskins, camels' wool, coal, wood, tobacco, fruit, and rhubarb. A very large proportion of the tea consumed in Asiatic Russia is shipped from the south to Tientsin, from which point it is taken overland by caravans to Kalgan and thence to Siberian ports.

In 1853 Tientsin was besieged by a strong force of Taiping rebels on their way to Peking, but they were defeated by the Mongol general San-ko-lin-sin and driven off. In 1860 it was taken by the Anglo-French punitive expedition on its way to Peking. While Li Hung Chang was Viceroy of Chihli, from 1870 to 1895, he made his headquarters at Tientsin, and in consequence the city was the centre of much political interest. Its importance in this respect greatly declined when Li was removed from office after the disastrous war with Japan in 1894–95. During the Boxer uprising in 1900 the foreign settlement suffered from the besieging Boxers, and the city from the relieving forces of the allies. The city held out until the severe fighting of July 13–14, during which the allies lost in killed and wounded between 800 and 900, the United States contingent, in proportion to its number, suffering most. The city is connected with the rest of the world by cable. Owing to the importance of the foreign business interests centred here, and the proximity of the town to Peking, the Viceroy of the province, whose seat is at Paotingfu, spends a large portion of the year here. As the river freezes over in winter, Tientsin is cut off from the outer world from about November to April, but the foreign admirals always agree to have at least one gunboat stationed off the bund during that period. The foreign concessions are favorite places of residence for the native Chinese merchants and business men, because of the settled and orderly conditions.

TIEPOLO, tē-ā′pō-lō, GIOVANNI BATTISTA (1696–1770). The last great master of the Venetian school of painting. He was born April 5, 1696, but was not a member of the celebrated family of Tiepolo, as has been supposed. At an early age he was placed with the painter Lazzarini, a mannerist, and perhaps studied with Piazzetta. He was, however, more influenced by Veronese. It is impossible to fix the dates for his pictures before 1737. We know that he was famous long before that, and was patronized by the Doge Cornaro and noble Venetian families, and by many cities and churches in northern Italy. The first of his principal works that can with certainty be dated are the beautiful decorations of the Villa Valmerana at Vicenza, executed in 1737. The subjects are taken from Homer, Vergil, Ariosto, and Tasso. In freshness and charm, in conception and technique, they bear favorable comparison with Veronese's masterpieces in the Villa Maser. In 1739 followed the three ceiling decorations in Santa Maria del Rosario (Venice), including the "Institution of the Rosary," and in 1743–44 those of the church of the Scalzi, the chief of which represents "Angels Bearing the Casa Santa from Nazareth to Loreto" (these were ruined by an Austrian bomb in 1915). To the same period belong the ceiling paintings of the Palazzo Rezzonico, and about 1745 he decorated the grand hall of the Palazzo Labia. The ceiling is highly fantastic, and the illusive architectural decorations of the walls form an admirable framing for two of his best frescoes, "Cleopatra's Banquet" and the "Embarkment of Cleopatra and Antony." The date of his decorations in the archiepiscopal palace at Udine, one of his best works, is not known.

Under the patronage of Karl Philipp of Greifenklau, Bishop of Würzburg, Tiepolo passed the years 1750–53 in that city, engaged in decorating the episcopal (now the royal) palace. On the lofty ceiling over the grand staircase he painted frescoes of "Olympus" and of the "Four Quarters of the Earth"; in the Kaisersaal, three scenes from the life of Frederick Barbarossa; in the chapel, two large altarpieces, the "Ascension of the Virgin" and the "Fall of the Angels." Returning to Venice in 1754, he became director of the Venetian Academy. Between this time and his departure for Spain he painted another grand ceiling decoration, the "Triumph of Faith," in the Chiesa della Pietà, and perhaps most of his easel pictures. In 1763 he was summoned by King Charles III to Spain to decorate the royal palace. In the guard room he painted the "Smithy of Vulcan," in the anteroom an "Apotheosis of Spain," and in the throne room magnificent ceiling frescoes of "Spain and her Provinces." At Madrid he executed most of his etchings, about 50 plates, the most important, showing the influence of Goya, being the series *Scherzi di Fantasia*. He died at Madrid, March 22, 1770.

In the classical reaction immediately following Tiepolo's death, scant justice was done him, and not until comparatively recent times has he been accorded his place. His art is essentially decorative, and harmonizes perfectly with the rococo architecture of the day. The color is light and flaky, and exquisitely delicate, and the treatment of light is above reproach. To a wonderfully rich fantasy and invention he joined an equal facility of execution. Sometimes he degenerates into extravagances, and what prevents him from ranking with the greatest artists of all time is the frivolity of his conceptions and the artificiality consequent upon the lack of a more direct contact with nature.

Tiepolo's easel pictures show the same grace of form and charm of color as his frescoes, and are more carefully composed and executed. Among the best known are "Christ in the Garden of Olives" and "Calchas and Iphigenia," in the Lichtenstein Gallery at Vienna; "St. Catharine of Siena" and an "Adoration of the Kings," in the Imperial Gallery (ib.); "Martyrdom of St. Agatha" and "After the Bath," in the Berlin Museum; the "Immaculate Conception" at Vicenza and Madrid; and a "Holy Family with St. Gaetano," in the Venetian Academy. In the Venetian churches are several altarpieces, like "Madonna in Glory" in the church of the Jesuits, and "Christ Bearing the Cross" in Sant' Aluise. He is represented in the Metropolitan Museum, New York, by five canvases, including two sketches for ceiling decoration. Of his two sons, who assisted in most of his works, DOMENICO (1727–1804) etched several of his father's paintings and painted inferior frescoes in his style, while of LORENZO, the younger son, almost nothing is known.

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TIERCE (OF., Fr. *tiers*, third part, from Lat. *tertius*, third, from *tres*, three). In music, an interval (q.v.) synonymous with a third. In the organ, a mutation stop pitched 2⅛ octaves above the diapason.

TIERCE. In heraldry (q.v.), a term of blazon used to indicate that the field is divided by lines into three equal parts of different tinctures.

TIER′CEROON. See QUADROON.

TIERGARTEN, tēr′gär-tən (Ger., Zoölogical Garden). The largest park of Berlin, on the south side of the Spree and west of the Brandenburg Gate. It contains 600 acres and is about 2 miles long. It contains a number of fine statues and the column of victory from which the Siegesallee, the most fashionable drive of the city, leads south.

TIER′NEY, GEORGE (1761–1830). An English politician. He was born at Gibraltar, Spain, was educated at Eton and Cambridge, and in 1778 entered Parliament as a Whig. There he soon acquired a high reputation as a debater, and, after Fox's withdrawal, became a prominent, if not the leading opponent of Pitt's policy. For several years it was his custom to bring forward a series of resolutions opposed to those of the Chancellor of the Exchequer. He was finally accused by the latter of deliberately impeding public business, and as a consequence fought a bloodless duel with him. In 1803 he became Treasurer of the Navy and a Privy Councilor, and after acting as Secretary of State for Ireland (1806) was President of the Board of Control (1806–07) and Master of the Mint in Canning's ministry (1827–28). After 1817 he was the recognized leader of the Opposition.

TIERRA DEL FUEGO, tē-ĕr′rȧ dĕl fwā′gō (Sp., Land of Fire; formerly often written in the corrupted form TERRA DEL FUEGO). An archipelago between lat. 52° 40′ and 55° 59′ S., off the extreme south end of South America, from which it is separated by the Strait of Magellan (Map: America, South, C 8). It consists of a large main island sometimes called King Charles South Land, and a number of smaller islands, lying to the west and south of it, the southern group being separated from the main island by Beagle Channel. The total area of the archipelago is estimated at over 27,000 square miles, of which the main island occupies more than four-fifths. The principal of the smaller islands are, beginning at the northwest, Desolación, Santa Inez, Clarence, Hoste, Navarin, Wollaston, and at the extreme south, Horn Island, ending in Cape Horn. At the extreme east lies the isolated Staten Island or Isla de los Estados. All these islands are separated from each other and from the mainland by narrow, deep, and tortuous channels, and are, together with the west coast of the main island, deeply indented by narrow fiords. The east coast is more regular. The Andean mountain system is continued in several ranges through the western part of the archipelago, covering all the smaller islands and the western half of the main island. They are mostly of Mesozoic formation with considerable granitic and volcanic intrusions, though there are no volcanoes. Their height averages 3500 feet, and Mount Sarmiento, an imposing snow-clad peak on the southwestern peninsula of the main island, has an altitude of 7200 feet. The eastern half of the main island is a continuation of the Patagonian plateau.

The climate of Tierra del Fuego is not so rigorous as it was formerly supposed to be. It is an equable oceanic climate with no extreme heat or cold. A meteorological station established since 1896 at Ushuaia on Beagle Channel shows a mean temperature for January to be 52.7° and for July 31°. The rainfall is greater than on the Patagonian plateau, and the country is more favorable for settlement than the more northern regions. The eastern region has good soil and pasture land, and along the base of the mountains there are extensive forests of beech (*Fagus antarctica*) and pine. The western islands, not yet thoroughly explored, are less favorable as regards climate and soil, but in the east and along Beagle Channel hardy cereals will ripen, and considerable areas of land have already been brought under cultivation by white settlers. Agriculture and cattle raising are the main occupations, though gold has been found in paying quantities, and seams of lignite have also been discovered. The native Fuegians are rapidly disappearing, and now number probably less than 1000. They belong to three distinct tribes—the Aliculufs in the central regions, the Onas in the west, and the Yaghans in the south. Politically the portion of the main island lying east of a line running from the eastern entrance of the Strait of Magellan to the middle of Beagle Channel, together with the Isla de los Estados, constitutes the Argentine Territory of Tierra del Fuego (q.v.). (See also Argentina, *History.*) The remaining portions belong to the Chilean Territory of Magallanes. The civilized population of the Argentine Territory, which contains practically all the inhabitants, was 2500 in 1912. The archipelago was discovered by Magellan in 1520, but not systematically explored until late in the nineteenth century.

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TIERRA DEL FUEGO. A territory of Argentina, formed of a portion of the main island of the Archipelago of Tierra del Fuego (q.v.) and of the Isla de los Estados (Map: Argentina, F 8). Its area is about 8299 square miles. The territory of the island was in dispute until 1881, when by arbitration of the United States it was divided between Chile and Argentina. The territorial government of the Argentine portion was organized in 1884. The principal river is the Popper. The chief industries are lumbering, seal fishing, and sheep raising. Pop. (est.), 2500, not including the Indians of the Ona tribes. The capital is Ushuaia (q.v.).

TIERS ÉTAT, tē-är′ zā′tā′. See States-General.

TIES, Railway. See Railways.

TIETJENS, tē′tyĕns, or **TITIENS,** Teresa (1831–77). An operatic singer, born at Hamburg, of Hungarian parents. She made her début in that city in the character of Lucrezia Borgia in 1849, taking at once a very high position on the lyric stage; at Frankfort and Vienna she was even more warmly received; and her first appearance in London in 1858 was a complete triumph. After this she remained permanently in London, making only two more tours, one to Paris (1863) and one to the United States (1875). She died in London. The great volume and purity of her voice and her sympathetic and dignified acting combined to make her famous in strong dramatic parts.

TIFFANY, Charles Comfort (1829–1907). An American Protestant Episcopal clergyman. He was born in Baltimore; studied at Dickinson College, at Andover Theological Seminary, and at Halle, Heidelberg, and Berlin; and was ordained priest in 1866. He was rector at Fordham, N. Y. (1867–70), assistant rector at Trinity Church, Boston (1871–74), rector in New York (1874–90), and Archdeacon of New York (1893–1902). His publications include *History of the Protestant Episcopal Church* (1895) and *The Prayer Book and Christian Life* (1897).

TIFFANY, Charles Lewis (1812–1902). An American merchant. He was born at Killingly, Conn., and after receiving an academic education at Plainfield Academy, and serving an apprenticeship in a cotton manufactory, he removed to New York City in 1837. There in partnership with a fellow townsman, John B. Young, on a borrowed capital of $1000, he established at 259 Broadway, next door to A. T. Stewart's, a stationery and fancy-goods store. The venture prospered, and gradually the jewelry part of the business became the most important. In 1847 the firm began the manufacture of gold jewelry. In 1848, when as a result of widespread revolutionary movements in Europe the price of diamonds fell one-half, Mr. Tiffany sent word to his partner, who was then in Paris, to buy all the diamonds he could. This was done; the house reaped a large fortune and became one of the principal firms of diamond merchants in the world. Several times rapidly increasing business necessitated moving farther up town and the firm name was changed somewhat, finally becoming Tiffany & Co. in 1851. At that time a branch house was established in Paris. During the Civil War Mr. Tiffany placed his store and resources at the disposal of the government, and it became for a time one of the principal depots of military supplies. During the draft riots (q.v.) in 1863 the store was barricaded and the clerks were armed in preparation for a threatened attack of the mob. In 1868 the firm was incorporated and in 1870 removed to a specially constructed building on Union Square. At that time, in addition to the Paris branch, a branch house was maintained in London, and an office and watch factory in Geneva, Switzerland, and the house took rank as the leading importers of gems and works of art as well as the chief manufacturing jewelers in America. In 1905 the firm removed to a splendid new building at Fifth Avenue and Thirty-seventh Street. Mr. Tiffany was the first to adopt the department-store plan for the jewelry business and was the originator of many ideas and methods in the jewelry trade since generally adopted. The sterling silver standard 0.925 fine, adopted by him in 1851, became the recognized standard throughout the country. Mr. Tiffany was made a member of the French Legion of Honor in 1878 and received at various times decorations from other foreign rulers. He was a liberal patron of the fine arts, and did much to encourage and promote the study and knowledge of art in America. For his son, see Tiffany, Louis Comfort.

TIFFANY, Louis Comfort (1848–). An American decorative designer and painter. He was born in New York City, a son of Charles Lewis Tiffany (q.v.), and studied under George Inness and Samuel Coleman, and in Paris with Léon Bailly, making a special study of the decorative arts in their relation to architecture. After his return to the United States he devoted himself to stained glasses, enamels, and other decorative work in connection with the Allied Arts Company and the Tiffany Studios, New York, of which he became director. He introduced the art of mosaic in America, producing designs of strength and fine decorative quality. His best-known invention is the Tiffany favrile glass, which possesses delicate refracting powers capable of iridescent effects. Louis Tiffany made paintings on glass to serve as windows in the old Columbia University Library; in Memorial Hall, Harvard; and in Chittenden Library, Yale; and for numerous churches, including the church of the Pilgrims, Brooklyn, and All Angels Church, New York. His principal mosaics are in the crypt of St. John's Cathedral, New York. Good examples of his easel paintings, principally Oriental scenes, are: "Algerian Shops" (1895) and "The Pool" (1896). He was elected a member of the National Academy in 1880, and Chevalier of the Legion of Honor (1900). His numerous prizes include gold medals at Paris (1900), Buffalo (1901), Dresden (1901), St. Louis (1904), Jamestown (1907), and San Francisco (1915). Consult *The Art Work of Louis C. Tiffany* (Garden City, N. Y., 1914).

TIF'FIN. A city and the county seat of Seneca Co., Ohio, 42 miles southeast of Toledo, on the Sandusky River, here spanned by several bridges, and on the Baltimore and Ohio, the Pennsylvania, and the Cleveland, Cincinnati, Chicago, and St. Louis railroads (Map: Ohio, D 3). It is the seat of Heidelberg University (Reformed), opened in 1850, and of the College of the Ursuline Sisters, and has the National Home of the Junior O. U. A. M. and a public library. Other prominent features are the courthouse and Riverview Park. Among its manufactures are tools, pottery, glass, emery wheels, elevating and hoisting machinery, church furniture, agricultural implements, wagons, well-drilling machines, nail, bolt, and nut machines, underwear, gloves, and woolen goods. Pop., 1900, 10,989; 1910, 11,894; 1915 (U. S. est.), 12,370.

TIFFIN, EDWARD (1766–1829). An American physician, preacher, and political leader. He was born at Carlisle, England, removed to Charlestown, Va., about 1786, and graduated in medicine at the University of Pennsylvania in 1789. In 1792 he became a local preacher in the Methodist church, and also studied law. About 1798 he removed to Chillicothe, in the Northwest Territory, and in 1799 was Speaker of the Territorial Legislature. In 1802 he presided over the convention to frame a State constitution of Ohio, and was the first Governor of the State (1803–07). During his second term he arrested the Burr-Blennerhasset expedition. In 1807–09 he was a member of the United States Senate, but resigned, and in 1809 was Speaker of the Ohio Legislature. When the General Land Office was established in 1812, President Madison appointed Tiffin the first Commissioner, and by his foresight the latter saved all the papers when the Capitol was burned by the British troops in 1814. From 1815 until just before his death he was Surveyor-General of the Northwest Territory.

TIFLIS′, *Russ. pron.* tyĕf-lyēs′. A government in the centre of Transcaucasia, Russia. Area, 23,146 square miles (Map: Russia, F 6). It belongs to the region of the Caucasus (q.v.) and contains numerous snow-clad peaks, including Kazbek, over 16,000 feet in height. Between the mountain chains are deep and narrow valleys, which make Tiflis one of the most picturesque and striking parts of the Caucasus. The principal river is the Kur. The climate is very severe in the mountainous region. About one-third of the total area is covered with forests. Agriculture is the principal occupation in the valleys and stock raising in the mountain regions. Besides cereals, of which wheat is the most important, fruits, especially grapes, are extensively raised. Various metals occur and copper is mined to some extent. The chief manufactures are flour, cotton goods, tobacco, spirits, etc. The natives produce various woolen articles, such as felt, rough cloth, etc., copper and silver articles, silver thread, filigree work, etc. Pop., 1912, 1,202,500, of whom the Georgians and the Armenians constituted 45 and 24 per cent, respectively, and the Russians less than 5 per cent.

TIFLIS. The former Georgian capital, the administrative centre of the Caucasus, and the capital of the Government of Tiflis, situated on the Kur, about 340 miles by rail northwest of the seaport of Baku (Map: Russia, G 6). The town presents a very mixed appearance. The Russian quarter is well built, with handsome churches and public buildings and European shops, while the native quarter is built in Oriental fashion. The most noteworthy ecclesiastical structures are the ancient cathedral of Zion, containing interesting icons and manuscripts; the monastery of St. David; and the old church in the fortress, supposed to date from the fifth century. There are a natural-history museum with a library, a sericultural station with a museum, and extensive botanical gardens. Agriculture is its chief occupation. Lying at the intersection of the trading routes from the Caspian to the Black Sea and from the Armenian uplands across the Caucasus, Tiflis enjoys considerable prosperity. The principal manufactures are felt, cotton goods, woolens, carpets, leather products, oil, wine, and tobacco. The trade, mostly in Armenian hands, is very extensive, Tiflis, in virtue of its railway connection with the two main seaports of the Caucasus, as well as with European Russia, being the distributing centre for Transcaucasia. Pop., 1913, 350,000, principally Armenians, Georgians, and Russians. The environs abound in sulphurous springs. The city is very hot in summer, when its mean temperature is 74° F.

TIGER (Lat. *tigris*, from Gk. τίγρις, tiger; probably connected with Av. *tiyra*, arrow, *tiyra*, sharp). The largest and most powerful of cats, *Felis tigris*, and the most specialized and efficient of the Carnivora, comparable only with the lion, and very similar in size and structure, but different in appearance and habits. It is more slender and catlike than the lion, with a rounder head, no trace of a mane, but with hair of the cheeks rather long and spreading. Its skull may be distinguished from that of the lion by the fact that the nasal bones reach backward beyond the frontal processes of the maxillæ. The males are larger than the females, and make a more square, less oval footprint or "pug." The pupil of the eye is round, however much contracted. The average size of an adult male is 9½ feet from nose to tip of tail. Authentic measurements exceeding 11 feet are very rare, and stories of 15 to 18 feet entirely erroneous. Its height at the shoulder is proportionately less than that of the lion, a large male measuring from 3⅓ to 3½ feet. A 10-foot tiger will weigh about 500 pounds. The hair is thick, fine, and shining; in the colder countries thicker and longer than in tropical regions. The color is a bright tawny yellow, beautifully marked with dark transverse bands, passing into pure white on the underparts; the dark bands are continued as rings on the tail, which is long and tapering and has no terminal tuft. These colors and stripes so blend with the gloom and slender shadows of the bamboo jungle or long grass as to make a lurking animal practically invisible.

The tiger inhabits Asia, where it has an extensive but rather localized distribution. Westwardly its range extends to the lower Euphrates and the southern shores of the Caspian; but it does not occur in Persia south of the Elburz Mountains, nor in Beluchistan or Afghanistan. Northward, it is to be found throughout southern Siberia and Mongolia, eastward in the Amur valley to the Sea of Okhotsk, in Sakhalin and Japan. The elevated Tibetan plateau has no tigers. Southward the species ranges throughout China, Siam, Burma, the Malay Peninsula, Sumatra, Java, and Bali, and all of India, but is unknown in Ceylon. This is an evidence leading naturalists to conclude that the tiger is a comparatively recent immigrant into the south, and not naturally a tropical species.

In general the tiger is an inhabitant of woods and thickets and although able to leap into or climb trees (except smooth, perfectly upright ones), it does so only for some special purpose. Usually it hides in dense cover by day and roams for prey at night. It is most numerous in the swampy shore jungles around the Bay of Bengal and on the Malayan coasts and marshy estuaries, where it swims miles from island to island or across rivers and inlets.

Its prey consists of almost anything in the way of flesh, from a bison or crocodile to any small creature which it may strike down. Carrion may be eaten under stress of famine, but as a rule the animal devours only what it has itself killed, and ordinarily does not even return to a carcass from which it has taken one full meal. It stalks its prey, or lies in ambush and leaps upon it like other cats; and its method of killing large animals is to seize the shoulders with one paw, grasp the forehead with the other, and break the neck by a twisting pull. A band of bison or wild oxen, guarded by bulls (see Bison), will beat it off and often kill it; even a single bull in favorable circumstances is a match for it. The elephant and rhinoceros have little to fear, and a bear will make a stout resistance, but such encounters rarely occur; nor do fights between male tigers seem to be common, as this cat is not, like the lion, polygamous. In India and eastward the tiger subsists largely upon domestic cattle and hogs, and upon human beings. Man-eaters, when they do not wholly depend upon human victims, apparently prefer them; many, but not all, of these victims are old and feeble. The destruction of human life in India and eastward is great, and there seems little diminution in spite of improved arms, number of sportsmen, and government rewards. In 1902 about 1300 lives were so lost in British India alone. The prey when struck down is usually carried away by the tiger to be eaten elsewhere, and many stories of the tiger's strength have been related. A tiger will lift from the ground and partly carry, partly drag, an animal of 200 or 300 pounds' weight, with considerable ease.

Tigers are solitary beasts, rarely hunting even in pairs, and much less noisy than the lion. Their usual call is a prolonged, moaning, thrilling sound, repeated twice or thrice and becoming louder or quicker. In the cooler season they wander widely, but in the hot weather remain in some narrow district near water—a single one in each beat. Tigresses breed irregularly, once in two or three years only, regardless of season, and produce usually two cubs, almost invariably one male and the other female. The cubs require three years to reach maturity and stay with their mother most of this time. When caught young tigers may easily be tamed, but are more difficult to rear and less tractable than lions. Captive and tamed tigers have been kept by the East Indian rulers from the days of antiquity, and a favorite amusement was to pit them in the arena against lions, in which combats they were usually victorious. The royal Bengal tiger has been a part of the showman's stock in trade ever since, and is to be seen in every menagerie, where these animals breed, but less readily than do the lions. Some have been trained to go through certain performances.

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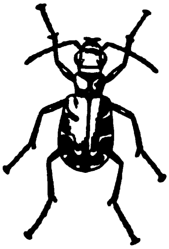
TIGER BEETLE. One of the active, predatory beetles of the family Cicindelidæ. Of carnivorous beetles they are among the most active, voracious, and fierce, whence their name. They frequent sandy places and earthen paths, and when approached run rapidly for some distance, occasionally turning suddenly back, and often taking to flight. While variously colored, and sometimes even bright green spotted with yellowish, they harmonize as a rule with the general color of their environment. Their larvæ live in deep, straight vertical burrows in the ground, and station themselves near the burrow's mouth, holding themselves in position by means of a pair of strong hooks on the fifth segment of the abdomen. The head and thorax are broad, and are used to block the mouth of the burrow while waiting for prey. The food consists of insects which alight on the spot or run over it. Some 1500 species are known, the majority inhabiting the tropics. Some species are wingless, others very active; some are found only on the mounds of termites; some frequent the trunks of trees, which they ascend in a spiral manner. Less than 100 species are known in the United States, but tiger beetles are abundant and are seen everywhere. The largest American form is *Amblychila cylindriformis*, found in sandy regions in the mid-Western States. *Tetracha carolina* and *Tetracha virginica* are large greenish species occurring in the Atlantic and Southern States. The genus *Cicindela* contains more than half the species in the entire family, and a great majority of the forms which are found in North America. A typical American species, the spotted tiger beetle (*Cicindela sex-guttata*), is depicted upon the Colored Plate of Insects.



A TIGER BEETLE.

TIGER CAT. Any wild cat of medium size which resembles the tiger in form or markings. The ocelot, serval (qq.v.), and especially the chati (*Felis mitis*) of South America, and clouded tiger of India, are frequently so called. See Wildcat.

TIGER EYE. See Crocidolite.

TIGER FLOWER (so called from the coloring), *Tigridia pavonia*. A plant of the family Iridaceæ, distinguished by the three large outer segments of the perianth and by the filaments being united into a long cylinder. It is a native of Mexico, but hardy enough to endure the climate of the United States, and it is often cultivated in flower gardens for the singularity and great beauty of its ephemeral flowers. The root is a scaly bulb.

TIGER HUNTING. A sport which probably taxes man's skill and courage in a higher degree than the pursuit of any other sort of game, and may justly be placed first in the lists of the chase. The enormous strength of the beast, coupled with savage cunning, renders it the most formidable of brute foes. Nothing is more patent in the voluminous history of the sport (see Tiger for outline of pertinent literature) than that no two tigers behave in the same way when encountered; the same animal may act differently at different times. Tigers learn by experience, have no fear of man as man, and rarely make tactical mistakes. In some parts of India hunters in parties go after them on foot, but this is regarded as extremely rash; the hunter's handicap is far too great, and few men dare its risks. Methods usually chosen are: (1) lying in wait for the animal at night (when there is moonlight) on an elevated platform, or (2) seeking him upon the back of a trained elephant. The former is the choice in cases where a tiger is known to haunt a particular locality. The hunter then chooses a likely spot and builds a platform or machan (usually in a small tree), which must be raised not less than 12 feet above the ground, and be large enough to hold two persons. On the ground near by is placed the carcass of a deer or cow; an even better bait is a tethered live goat. An hour before sunset the hunter, with a native assistant, climbs upon the platform and awaits the coming of the tiger. Sometimes the animal steals out of the shadows and seizes and carries off the prey too quickly for a shot. Again it will stalk boldly out and stand in full view. Sometimes when fired at, but not killed, it darts back into the jungle and disappears, but it may also attack and tear down the machan, or lurk near by to seize the men when they descend.

The most effective method of hunting the tiger is by means of elephants, and with the aid of native shikaries and beaters. Frequently the preparations are upon a scale of royal magnificence, for so kings and princes are accustomed to entertain one another in the East, especially when a native ruler desires to honor or gratify some European guest or ally. On such occasions the game has been surrounded and watched for days by an army of natives. King Edward VII was thus entertained when visiting India as the Prince of Wales. The method is to surround the tiger by a sufficient number of beaters, who by noise of drums drive it towards the favorable spot where the sportsmen are waiting upon the backs of elephants, which are furnished with open, boxlike howdahs. As the circle narrows the drivers become more cautious, for the animal knows the country perfectly, and will make use of every means of escape or attack. Men are stationed in trees to try to trace his movements and warn by cries and signs. Meanwhile the sportsmen press forward on their elephants, depending largely upon the sagacity of these animals for a warning of the terrific and usually unforeseen charge of the animal, which may by a bold leap tear the hunter from the howdah, or stampede the elephant, or get through the barrier alive. Nine out of ten elephants, even if stanch before, will become panic-stricken and bolt, when the danger of their riders being dashed against a tree and killed is imminent. Unforeseen casualties are numerous, and the reward is only a hide, which may often be of inferior beauty and value.

TIGER LAKE. See Nahuel-Huapi.

TIGER LILY. See Lily.

TIGER MOTH. A name applied on account of their coloration to certain moths of the family Arctiidæ, as *Arctia nais*, and especially to the Isabella tiger moth (*Isia isabella*), an American species, grayish yellow with black markings. The caterpillar is known as the woolly bear, and is densely clothed with reddish brown and black hairs. It feeds upon a great variety of low-growing herbage. See Colored Plate of American Moths, under Moth.

TIGER SHARK. The largest, fiercest, and most formidable of West Indian sharks (*Galeocerdo tigrinus*), brown in color, with numerous small dark spots which give the fish its name, but grow indistinct with age.

TIGER SNAKE. An elapine, poisonous snake (*Hoplocephalus curtus*) of Australia. See Death Adder.

TIGERT, John James (1856–1906). An American Methodist bishop, born in Louisville, Ky. He graduated from Vanderbilt University in 1877 and later studied at the Southern Baptist Theological Seminary. Between 1881 and 1890 he was tutor and professor of moral philosophy in Vanderbilt University. He entered the ministry of the Methodist Episcopal Church South in 1890. From 1894 to 1906 he was the editor of the *Methodist Quarterly Review* of Nashville and the book editor of the Methodist Episcopal Church South. In 1906 he was elected bishop. He edited several works, among them *The Doctrines of the Methodist Episcopal Church in America* (2 vols., 1902), and wrote: *A Constitutional History of American Episcopal Methodism* (1894; 2d ed., revised and enlarged, 1904); *The Making of Methodism* (1898); *Theism* (1901); *The Christianity of Christ and his Apostles* (1905).

TIGER WOLF. See Dasyure.

TIGHE, tī, Mrs. Mary (Blachford) (1772–1810). An Irish poet. Her father, a clergyman, was a librarian in Dublin. In 1793 she married her cousin, Henry Tighe, a member of the Irish Parliament. Mrs. Tighe was greatly admired for her beauty, and for her poem, in Spenserian stanzas, *Psyche, or the Legend of Love* (privately printed in 1805). The poem was a version of the story of Cupid and Psyche in the *Golden Ass of Apuleius*. This and other poems were published in 1811, with a portrait after a painting by Romney.

TIG'LATH-PILE'SER (Heb.; Ass. *Tukulti-apal-E-sharra*, My confidence is the son of Esharra, i.e., Ninib). The name of several Assyrian kings: 1. Tiglath-pileser I (c.1140–1105 B.C.) was the son of Asurresisi II. Under him the dominion of Assyria was considerably enlarged by conquests in northern Syria, Commagene, Melitene, Cappadocia, Armenia, and Kurdistan. He claimed to have conquered no less than 42 countries, and in his days Babylonia was forced to acknowledge Assyrian supremacy. He placed his statue on the Supnat, a tributary of the Tigris. Twice he invaded the south and entered the city of Babylon itself. His activity in rearing temples and palaces was no less remarkable, and he devoted himself especially to the embellishment of the old city of Assur (q.v.) on the Tigris, which he once more made the seat of government in place of Calah. Although he was able to hand over the succession to his son Asurbelkala, his great empire was not maintained, and shortly afterward a period of decay set in. 2. Tiglath-pileser II (c.1050 B.C.) is little known. 3. Tiglath-pileser III (c.950 B.C.) apparently belonged to the same dynasty, but no inscriptions by him throw any light upon his reign. 4. Tiglath-pileser IV (745–728 B.C.) was a usurper. Rising from obscurity, he either set on foot a rebellion against Asurnirari IV, or availed himself of an opposition that had sprung up against this King to seize the throne for himself. He assumed the name of Tiglath-pileser as King, his original name having been Pulu or Pul, by which he continued to be known in Babylonia and which is given to him likewise in the Old Testament (2 Kings xv. 19). To reënforce his position he proceeded to the south and brought to submission the Aramæan tribes, who had been causing the Babylonians considerable trouble. Securing in this way the good will of the Babylonians, by whom he was hailed as a deliverer, he could devote himself to the troublesome neighbors in Media to the east of Assyria. Two expeditions were required before the pacification of the country was secured. Tiglath-pileser IV appears to have introduced the policy of planting Assyrian colonies in hostile districts with a view of thus making Assyrian influence a more permanent factor than could be accomplished merely by military invasions. Successful also in breaking up a combination that had been formed against him in Ararat under the leadership of Sarduris II, aided by a group of allies in Asia Minor, he secured a large booty in a battle in which he claims to have captured no fewer than 72,950 soldiers of the enemy. He encountered more difficulty in quelling a revolt in northern Syria in 742–740 B.C. As early as 739 B.C. there was a conflict between the Assyrians and Azariah of Jaudi. The King overthrew Azariah and his allies and again showed his administrative abilities by placing the hostile district, divided into small principalities, under Assyrian governors. He enumerates in his inscriptions a long list of rulers of petty states in Asia Minor and Syria who brought him tribute, and among these we find Menahem of Samaria, the notice thus confirming the statement in 2 Kings xv. 19–21.

In 734 B.C. Tiglath-pileser IV again proceeded to the west, being appealed to by Ahaz, King of Judah (2 Kings xvi. 7), to assist him against the combination formed by Pekah, King of Israel, and Rezin of Damascus. Rezin was defeated and fled to his capital, and while a portion of the Assyrian army laid siege to it, another section was sent to ravage and plunder the Syrian, Israelitish, and Philistine towns. In 732 B.C. Damascus fell and an Assyrian official was appointed governor. Among those who hastened to pay homage to Tiglath-pileser, we find his vassal King Ahaz of Judah. This visit is the one referred to in 2 Kings xvi. 10. Tiglath-pileser IV also claims to have deposed Pekah of Israel and to have put Hoshea in his place. According to the biblical statement (2 Kings xv. 30) Pekah was murdered in the course of a revolt instigated by Hoshea, who no doubt was abetted by the Assyrian King. Shortly after his successful campaign in Syria and Palestine, Tiglath-pileser IV was obliged to proceed once more against Babylonia, where trouble had broken out. Two years elapsed before he could take the decisive step of having himself crowned King of Babylonia. The ceremony took place on the Babylonian New Year's festival of the year 728 B.C. As King of Babylonia he assumed his original name of Pulu (identical with Parus in the Ptolemaic canon). Not long afterward, in 728 B.C., he died, leaving his policy of political centralization to be carried on by his son Shalmaneser V. Consult the Babylonian-Assyrian histories of Winckler, Tiele, Hommel, Rogers, Johns, and other works quoted in the article on ASSYRIA.

TIG'LIUM, OIL OF. See CROTON OIL.

TIGRA'NES (Lat., from Gk. Τιγράνης, Armen., *Tigran*). The name of several kings of ancient Armenia. The most famous was Tigranes the Great, who was born about 121 B.C. He was for many years a hostage at the Parthian court, but was exchanged for 70 districts about 95 B.C., when he succeeded to the throne. He made an alliance with his father-in-law, Mithridates (q.v.), King of Pontus, against the Romans. About 83 B.C. he conquered Syria, later extending his power over much of Asia Minor, besides taking from the Parthians Mesopotamia and other provinces. In 71 B.C. Mithridates fled to him for refuge from the Roman general Lucullus (q.v.). In 69 B.C. Tigranes was defeated by the Romans at Tigranocerta, his newly founded capital, although a mutiny prevented Lucullus from following up his advantage. Three years later Pompeius (q.v.) took the field against the Armenians, and in 64 B.C. after a long siege compelled Tigranes to surrender at Artaxata. He remained in possession of Armenia Major, and died about 56 B.C., being succeeded by his son Artavasdes. Consult Théodore Reinach, *Mithridate Eupator roi de Pont* (Paris, 1890).

TIGRÉ, tē-grā′. The northernmost of the three divisions of Abyssinia proper, lying north of the Bahr el Aswad (Map: Egypt, D 5). The capital is Adowa (q.v.). Tigré contains the town of Axum (q.v.), which is noted for its antiquities and which was the capital of the old Ethiopic empire. The language of the country is Tigrina, a Semitic dialect which more nearly resembles the ancient Geez than does the Amharic (q.v.). Tigré is administered by a ras and is variously called a division, a province, or a kingdom of the Abyssinian Empire.

TI'GRIS (Greek, from the old Persian *tigra*, an arrow). One of the two large rivers which inclose the historic region of Mesopotamia, in Asiatic Turkey (Map: Turkey in Asia, E 3). Its origin is usually traced to the southern flank of the eastern Tauric Mountains south of Kharput, but the Bitlis and Botan springs, on the south slope of the Van Mountains, supply the greater head of water. Thence it flows in a winding southeast course of about 950 miles till it joins the Euphrates at Korna to form the Shat el Arab, which after a short course flows into the Persian Gulf. The Tigris is a rapid and turbid stream. In its upper course it receives numerous tributaries from both sides. Below Mosul, the tributaries come nearly all from the east, the region between the Tigris and the Euphrates being here a desert overgrown with wormwood and similar scrub. Farther down the Tigris communicates across the desert with the Euphrates by a number of bayous or canals, some of which are dry the greater part of the year. At the confluence the Tigris, though shorter than the Euphrates, is more voluminous, and it is navigable for steamers to

Bagdad, above which foreign steamers are not allowed. Thence smaller vessels proceed to Mosul, and above that city rafts descend (they are broken up and transported back by camel) from Diarbekir, almost at the source of the river. The main tributary of the Tigris is the Diyala, which joins it from the east, a short distance below Bagdad, and which is navigable for some distance by small vessels. Next to the Diyala, the largest affluent is the Greater Zab. Outside of the three cities mentioned the banks of the Tigris are very thinly populated. Among the remains of ancient cities on the banks of the Tigris are those of Nineveh, Seleucia, and Ctesiphon.

TIGUA, tē'gwȧ. A group of pueblos in New Mexico speaking a Tanoan language. See Tanoan Stock.

TIKUS. See Bulau.

TILANUS, tā-lä'nụs, Christian Bernard (1796–1883). A Dutch surgeon, born at Harderwijk. He studied medicine at Utrecht (M.D., 1819) and became, in 1828, professor of surgery and gynecology at Amsterdam. Before his time the teachers of surgery in the Netherlands, who were also anatomists, had taught the subject from the theoretical standpoint only, while practice was left to a less highly educated clan of surgeons. Tilanus was a practical surgeon as well as a professor. In 1848, at his instance, a chair of gynecology, separate from surgery, was founded. He retired in 1872, but his influence upon surgical education in Holland continued to be of great importance.

TILBURG, tĭl'bērg. A manufacturing town in the Netherlands, Province of North Brabant, 36 miles southeast of Rotterdam, and 19 miles east of Breda (Map: Netherlands, D 3). The town has a new church in the Gothic style, and a cloth hall, and is besides an important manufacturing centre, with more than 300 factories, most of them woolen and cloth mills, and tanneries, and iron foundries. Pop., 1910, 50,326.

TILBURY, Gervase of. See Gervase of Tilbury.

TIL'BURY FORT. A fortification in Essex, England, on the north bank of the Thames, opposite Gravesend, 30 miles below London (Map: England, G 5). Originally erected in the time of Henry VIII as a blockhouse, it was converted (1667) into a regular fortification after the bold expedition of De Ruyter into the Thames and Medway, and has been greatly strengthened since 1861. The large docks, comprising 588 acres, are important, as the passenger traffic with London by steamship centres here.

TIL'DEN, Douglas (1860–). An American sculptor. He was born at Chico, Cal., and studied at the National Academy of Design, New York, with Ward, Flagg, and Mowbray, and for several years under Paul Chopin in Paris. Afterward he was professor of sculpture at the Mark Hopkins Art Institute, University of California (1894–1900). Good examples of his work, which is modern in spirit and treats typically American subjects in a robust, realistic manner, are: "Baseball Player" (1889, Golden Gate Park, San Francisco); "Tired Boxer" (1890, Olympic Club, San Francisco); "Indian Bear Hunt" (1892); "Foot-Ball Players" (1893, University of California); the "Native Sons' Fountain" (1894) and the overexuberant "Mechanics' Fountain," both in San Francisco. Important among his various public monuments are: the "Commemoration of the Admission of California into the Union"; "California Volunteers of the Spanish-American War"; the memorial to Junipero Serra (San Francisco); and Senator Stephen M. White (Los Angeles). He became a member of the National Sculpture Society. Totally deaf from the age of five, he originated and was vice president of the first International Congress of the Deaf, held in Paris in 1889.

TILDEN, Samuel Jones (1814–86). An American lawyer and statesman, born at New Lebanon, N. Y. He attended Yale College and the University of the City of New York, where he graduated in 1837; studied law, and in 1841 was admitted to the bar of New York City. As a lawyer he rose to the first rank. In 1846 he was a member of the State Legislature, in which he devoted his attention particularly to the subject of the State canals, and in the same year served as member of the State Constitutional Convention. In 1867 he once more sat as a delegate to the Constitutional Convention. Having been elected again to a seat in the Legislature, he took the lead in 1872 in impeachment proceedings against Barnard and Cardozo, two of Tweed's corrupt and subservient judges. He helped expose the frauds of the Tweed Ring, having the leading part in the prosecution of its guilty members. By 1868 he had become acknowledged leader of the Democratic party in New York, and his activity in overthrowing the Tweed Ring led to his election in 1874 as Governor of the State. His administration (1875–76) was marked by economy in the management of the State canals. In June, 1876, he was nominated by the Democratic National Convention at St. Louis for President of the United States, and in the ensuing presidential election received a majority of the popular vote, and according to the final count came within one vote of receiving a majority of the electoral vote. Because of alleged frauds in the elections of Louisiana, South Carolina, and Florida, the votes of those States, which were nominally given for the Democratic party and which would have turned the election in Tilden's favor, were claimed by the Republicans, and the excitement which followed threatened to disturb the peace of the country. Finally Congress created an Electoral Commission (q.v.), consisting of five justices of the Supreme Court, five Senators, and five Representatives, to settle the dispute, and by a strict party vote of 8 to 7 it gave its decision in favor of Tilden's opponent, Rutherford B. Hayes (q.v.). Tilden thereupon promptly requested his friends to accept the decision, though many continued to believe and to assert that he had rightfully been elected president. He lived his remaining years in retirement near Yonkers, N. Y. He bequeathed the greater portion of his fortune of about $5,000,000 to philanthropic purposes, chiefly for the establishment and endowment of a public library in the city of New York. The will was contested and only about $2,000,000 went to the establishment of the Tilden Foundation of the New York Public Library (q.v.). Consult: John Bigelow, *Life of Samuel J. Tilden* (2 vols., New York, 1895); id., *Letters and Literary Memorials*, edited by John Bigelow (2 vols., ib., 1908); id., *Writings and Speeches*, edited by John Bigelow (2 vols., ib., 1885); also Haworth, *The Disputed Election of 1876* (Cleveland, 1906).

TILDEN, Sir William Augustus (1842–). An English chemist, born in London. He was educated at the Royal College of Chemistry, and served successively as science master, Clifton College (1872–80); professor of chemistry, Mason College (1880–94); and professor of chemistry, Royal College of Science, London (1894–1909). He was president of the Institute of Chemistry in 1899–1903 and of the Chemical Society of London in 1903–05, and in 1908 he received the Davy medal from the Royal Society. In 1909 he was knighted. He published: *Introduction to Chemical Philosophy* (1876); *Practical Chemistry* (1880); *Hints on Teaching Chemistry* (1895); *A Manual of Chemistry* (1896); *A Short History of the Progress of Scientific Chemistry* (1889); *The Elements* (1910).

TILE (AS. *tigol*, *tigele*, from Lat. *tegula*, tile, from *tegere*, to cover). Properly a piece of material for covering a roof, but limited to harder materials than wood. Slate, marble, and other stones which can be cut into thin slabs and resist ordinary breakage have been used for tiles. Ordinary roof tiles are of earthenware and these may be perfectly flat and used to shed the water by being laid over one another on a sloping surface, exactly as shingles are laid. There is also a kind of tile which has a flat and a raised ridgelike convexity cast or molded in the same piece which is known as the pan, or Belgic tile. From the use of the term to cover various kinds of clay products it has come to have two different meanings. First, any flat slab, if small and forming one of many pieces used to cover a large surface, is a tile; second, the different ceramic wares used in building and in all kinds of engineering work, drainage, and the like are called tiles.

The tile floors of the Middle Ages were composed of earthenware tiles, each of which is complete and of one color, or incised with a pattern in such a way that a different-colored clay may be inlaid. In the south of Europe tiles were much used according to a fashion prevalent in the East. In Spain tiles with intaglio patterns filled in with colored glazes were made extensively in the sixteenth and seventeenth centuries. These tiles, unfit for floors, are very decorative when used for the linings of walls. They are known as Cuenca tiles. The Gothic revival in England between 1840 and 1870 brought with it a strong movement to restore these appliances of decorative buildings; and many tile floors were designed and made in mediæval taste. In consequence of this the earthenware tile industry became an extensive one in Great Britain and for many years the greater number of tiles imported into the United States came from England. Other tiles have been made with heads, human figures, and groups in slight relief, the ornamentation being obtained by sculpture rather than color.

Clay tiles may be divided broadly into solid and hollow, the former being thin and, except for some roofing tiles, generally flat, while hollow tiles have a great variety of thickness and shape. In the preparation of the clay for molding some one or more of the processes described under Clay, *Clay Mining and Working*, are employed, varying with the class of clay and the final product. For tile burning, see Kiln; Terra Cotta.

Encaustic Tiles, for floors, walls, and other purposes, are decorative tiles in which the main body is of one color of clay and a pattern is inlaid in a contrasting color of clay. The term is a mere trade name, without special significance. Unglazed floor tiles in plain colors, the design being made by the combination of tiles of different colors and shapes, are commonly called mosaic tiles. Tiles bearing fixed designs in vitrifiable colors are also sometimes called encaustic tiles. The famous Dutch tiles are simply enameled earthenware, usually in blue, but sometimes in colors, and generally with Scriptural subjects for the design.

Floor Tiles are now made by machinery in metal dies, in which they are subjected to heavy pressure by what is known as the Prosser process. The clay is first prepared as for ordinary ceramic work and then dried again and ground to powder. Wall tiles are made with the back surface broken by undercutting, so the cement may have a better hold. They usually have a highly glazed surface. Floor tiles are generally preferred unglazed. The pattern is produced by the use of brass plates, ⅛ of an inch thick, or paper stencils, a separate one being used for each color. Thus, for an ornament in red and white on a blue ground, one plate is perforated so as to enable the red portion of the clay powder to be filled in, another is cut for the white portion, and a third for the blue ground, etc. When all are filled up the tile is subjected to great pressure in a screw press and fired as in the ordinary plain tile.

Fireproofing, Structural, or Hollow Tiles are rapidly growing in use (see Fireproof Construction), particularly for fitting around steel columns and girders forming partitions, floor arches, and ceilings. Their lightness is greatly in their favor. They are divided into three classes: dense, porous, or terra-cotta lumber, and semiporous. Dense tiles are prepared for molding much like terra cotta. They are given heavy pressure and a long burning, and are sometimes made from fire clay. Porous tiles are made by mixing one part by bulk of soft wood sawdust or finely cut straw with two parts of clay, passing the mixture through a disintegrator or cutter, and then between two sets of corrugated rolls, one below the other. From the rolls conveyors take the mixture to the tile machines described below. The subsequent burning destroys the sawdust or straw, leaving a very porous tile into which nails may be driven, or which may be cut with a saw; hence the name terra-cotta lumber. Semiporous tiles are made of good fire clay containing 60 per cent of silica, calcined fire clay, and coarsely ground bituminous coal. These materials are mixed, molded, and burned much like porous tiles.

Hollow Tile Machines are of various forms according to the character of the clay. The tempered clay is forced through forms and around plugs. The forms give the outer and the plugs the inner shape to the tiles. The plugs are of metal, with their front ends just inside the form. Plungers force the clay over or around the plugs, then through the forms. The continuous shapes are separated by wires or knives. Some of the special forms require partial hand shaping.

Roofing Tiles, when of clay, are something like terra cotta (q.v.) in their composition and manufacture. They are made in various colors and shapes, the shapes being governed largely by the kind of vertical joints employed. In Pennsylvania flat, or Germanic, tiles of unglazed red clay, about 15 inches in length with a nib at the back for hanging on a rafter, were made extensively through most of the eighteenth century.

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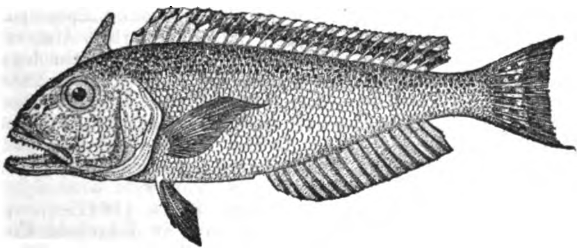
TILEFISH (name coined from penultimate syllable of generic name). A deep-sea fish (*Lopholatilus chameleonticeps*) chiefly remarkable for its strange history. It was accidentally discovered in large numbers in 1879 by fishermen trawling for cod south of Nantucket, and was found again in 1880 and 1881. In the spring of 1882 shipmasters reported that an immense area of ocean surface about 300 miles south of Long Island was covered with many millions of floating fish, dead or dying, chiefly tilefish, which showed no marks of injury or disease. Verrill and other ichthyologists, judging by various circumstances, explained this as the result of an incursion of cold water, forced by the heavy northerly gales of that spring, into the warm area of the Gulf Stream.



TILEFISH.

This fish represents a genus of the family Malacanthidæ, which includes several edible fishes of the seas of both sides of tropical America, one of which, the blanquillo or whitefish (*Caulolatilus princeps*), is a well-known food fish of southern California. The tilefish is a large, big-headed, brilliantly colored, active fish, sometimes 40 pounds in weight, but ordinarily from 10 to 20 pounds. It is characterized by a high adipose protuberance upon the nape in advance of the long dorsal fin, and by a short barbel at the angle of the lips on each side. Its flesh was found to be excellent, and the United States Fish Commission made great efforts to learn where it might be found, but the disaster of 1882 seemed to have wholly exterminated the species. Some 10 years later an occasional one was captured, and investigation of the edge of the continental plateau was resumed by the Fish Commission. It was finally determined that the area of their distribution extends along a band of sea bottom from about 39° N. lat. southward between 69° and 73° W. long. to an unknown distance, in water from 60 to 80 fathoms deep, wherever the water has a temperature not colder than 50° F. Increasing catches were made in 1902 and in succeeding years.

Consult: Collins, "History of the Tile Fish," in *Annual Report of the United States Commissioner of Fish and Fisheries for 1882* (Washington, 1884); F. A. Lucas, in *Annual Report of the United States National Museum for 1889* (ib., 1891); H. C. Bumpus, "The Reappearance of the Tilefish," in *Bulletin of the United States Fish Commission* (ib., 1899).

TILE KOLUP. See Holzschuh.

TILGHMAN, tĭl′măn, Matthew (1718–90). An American patriot, born in Queen Anne Co., Md. He was early engaged in the Indian wars, and in 1751 was elected a delegate to the Maryland Assembly, where he sat continuously until the formation of the State government, Feb. 5, 1777, and was Speaker of the House in 1773–75. From 1774 until the establishment of the State government he was president of the convention which exercised the chief authority. He was also head of the Committee of Correspondence of the Council of Safety, and of the delegation to the Continental Congress. He was a strong advocate of independence, but was prevented from signing the Declaration of Independence by being called home to preside over the convention to frame a State constitution. He was an earnest, enthusiastic patriot and did much for the American cause in Maryland.

TILGHMAN, Tench (1744–86). An American soldier, born near Easton, Md. Prior to the Revolution he was engaged in mercantile pursuits at Philadelphia, but early in 1775 entered the American army as lieutenant in an infantry company, and in July was sent as a special commissioner to treat with the Iroquois. From August, 1776, until the close of the war, he was an aide and military secretary of General Washington, participating in all the battles of the main army during this period; and in October, 1781, carried to Congress the news of Cornwallis' surrender, covering the distance from Yorktown to Philadelphia in four days. In May, 1781, he was made a lieutenant colonel, to take rank from April 1, 1777, and in October, 1781, Congress voted him "a horse properly caparisoned and an elegant sword, in testimony of their high opinion of his merit and ability." After the war he removed to Baltimore, where he died. Consult *Memoir of Tench Tilghman* (Albany, 1876).

TILGNER, tĭlk′nẽr, Viktor (1844–96). An Austrian sculptor. He was born in Pressburg, and studied under Franz Bauer and Joseph Gasser at the Vienna Academy. He was later influenced in favor of the baroque and rococo styles by the French sculptor Déloye, and at the Exposition of 1873 attracted much attention with his bust of the actress Charlotte Wolter. This was the first of a series of remarkably spontaneous and individual portraits, which include the statue of Emperor Francis Joseph and the busts of Crown Prince Rudolf, Hans Makart, Liszt, and Rubens (Künstlerhaus, Vienna). His strong sense of the decorative later found expression in such vital and attractive works as fountain groups for the Imperial villas at Ischl and in the Volksgarten and the Tiergarten near Vienna, the heroic-sized figure of "Falstaff" (Burgtheater, Vienna), and a number of successful polychrome busts and genre statuettes. In his monuments, such as those to Hummel at Pressburg, to Werndle at Steyr, and to Mozart (1896) at Vienna, he combined baroque extravagance with a thoroughly naturalistic treatment.

TIL'IA'CEÆ (Neo-Lat. nom. pl., from Lat. *tiliaceus*, relating to the linden, from *tilia*, linden tree, Gk. *πτελέα*, *ptelea*, Arm. *teλi*, elm). The Linden Family. A family of dicotyledonous trees, shrubs, and rarely herbs, including about 35 genera and 275 species, widely distributed in warm and tropical regions, a few occurring in the temperate zones. The representative of the family in the north temperate zone is *Tilia*, with about 20 species, which are trees variously known as linden and basswood. The Tiliaceæ yield valuable light timber (see Grewia), jute or corchorus (q.v.), and other fibres.

TILL. The unstratified deposit of clay, bowlders, and more or less sand that lies upon bed rock in the region covered by the Pleistocene ice sheet. It is also called bowlder clay. See Glacial Period.

TILLAGE (from *till*, AS. *tilian*, *teolian*, OHG. *zilôn*, *zilên*, Ger. *zielen*, to aim, strive for). The process of stirring and mixing the soil for the purpose of increasing its productiveness. The operations of plowing, harrowing, spading, hoeing, etc., constitute tillage. There are three distinct classes of tillage: (1) surface tillage brought about by such implements as plows, harrows, cultivators, and weeders; (2) subtillage, such as is secured by use of subsoil plows and other deep-tillage implements; and (3) intertillage, such as is carried on while the soil is occupied by a crop. Pulverizing the soil by tillage not only favors the root growth of plants but improves the moisture and other physical conditions of the soil, checks evaporation, promotes weathering and disintegration, which set plant food free, supplies conditions favorable to the activity of beneficial organisms in the soil (nitrification, q.v.), and destroys weeds (and in many cases injurious insects). Deep tilth of soil is generally desirable, but should as a rule be brought about gradually. See Plow, Plowing.

TIL'LAMOOK. See Salishan Stock.

TILLEMONT, têl'mōɴ', Sébastien le Nain de (1637–98). A French ecclesiastical historian, born in Paris. He was educated at Port Royal, under the Jansenist influence, and was ordained a priest in 1676. In 1681 Tillemont made a visit to Holland and Flanders, for the purpose of seeing Arnauld and other Jansenist refugees. He had worked meanwhile on his Church history. To avoid the opposition of the censor, he separated from the Church history the history of the emperors, which he was enabled to print as a distinct work, without referring it to the censorship, under the title *Histoire des empereurs, etc.* (1691–1738). In 1693 the first volume of the Church history appeared under the title *Mémoires pour servir à l'histoire ecclésiastique des six premiers siècles*, complete in 16 volumes (1693–1712). The *Histoire des empereurs* comprises all the reigns from Augustus to Anastasius (518); the *Histoire ecclésiastique* comes down to about the same period. Both are laborious compilations from the original writers. He was also author of *Vie de Saint-Louis* (new ed., 1847–51).

TIL'LETT, Ben(jamin) (1859–). An English labor leader and Socialist, born at Lower Easton, Bristol. As a boy he worked in coal pits and brickyards until he was 14 years old, and then went to sea, spending three years in the merchant service and two in the navy. While working as a tea cooper he came in contact with the dock and wharf work, and in 1887 was active in organizing the Tea Coopers' and General Laborers' Association. Later he succeeded in forming the Dock, Wharf, and General Workers' Union of Great Britain and Ireland, of which he was thereafter general secretary, and with Tom Mann (q.v.) he led the Great Dock Strike of 1888. For many years he was an alderman in the London County Council, and he contested seats for Parliament in 1892, 1895, 1906, and 1910. In 1915 he visited the British battle front in France, and upon his return urged the working class to increased efforts to supply the needs of the soldiers. He wrote *Trades Unions and Socialism* (1894) and *History of the London Transport Workers' Strike, 1911* (1912).

TILLETT, Wilbur Fisk (1854–). An American Methodist clergyman and educator, born at Henderson, N. C. He graduated from Randolph Macon College in 1877 and from Princeton Theological Seminary in 1880. He entered the ministry of the Methodist Episcopal Church South in 1881. In Vanderbilt University he was professor of systematic theology and dean of the theological faculty after 1884 and vice chancellor after 1886. He published *Personal Salvation* (1902; Span. trans.); *A Statement of the Faith: World Wide Methodism* (1906); *Hymns and Hymnwriters of the Church* (1911), with C. S. Nutter.

TILL'MAN, Benjamin Ryan (1847–). An American politician, born in Edgefield Co., S. C. He was educated at Bethany Academy, became a planter, and interested himself in the development of industrial and technical education in South Carolina. He became the recognized leader of the farming element in the Democratic party in South Carolina, received the support of the Farmers' Alliance, and in 1890, as the Democratic candidate, was elected Governor of the State. He was reëlected in 1892, and secured the passage of a law providing for the dispensary system of selling liquor under State control. In 1894 he was elected United States Senator, being reëlected to that office in 1900, 1906, and 1912. His speeches against President Cleveland in 1895–96 in the Senate won him the name of "Pitchfork" Tillman. He was active in both free-silver campaigns, in 1896 and 1900, as one of the most radical supporters of the candidacy of W. J. Bryan. An assault which he made on his colleague, J. L. McLaurin, in the Senate, Feb. 22, 1902, led to the censure of both by that body. From 1912 he was a member of the Democratic National Committee.

TIL'LO, Alexei Andreyevitch (1839–1900). A Russian general and scientist, distinguished for his work in geodesy, meteorology, terrestrial magnetism, hypsometry. He was born at Kiev and was a student, then an officer, in Russian military schools. He studied at the Astronomical Observatory at Pulkova, receiving a thorough training in geodesy under Struve and Doellen, and it was chiefly through his efforts that the Imperial Department of Agriculture organized expeditions to study the sources of the principal Russian rivers. His elaborate investigations and careful computations of isobaric, magnetic, and locational elements won him a European reputation, and his works include atlases of isobars of Russia and Asia, of distribution of magnetic lines and catalogues of latitudes and longitudes.

TILLODONTIA, tĭl'lō-dŏn'shĭ-à (Neo-Lat. nom. pl., from Gk. *τίλλειν*, *tillein*, to pluck, tear + *ὀδούς*, *odous*, tooth). An extinct suborder of early Tertiary fossil mammals supposed to be ancestral to the modern rodents. The principal genera, *Esthonyx*, *Tillotherium*, *Stylinodon*, *Dryptodon*, and *Anchippodus*, are found in the Eocene and Miocene beds of the western United States. See RODENTIA.

TIL'LOTSON, JOHN (1630–94). Archbishop of Canterbury. He was born in Sowerby, in Yorkshire, in 1630, the son of a clothier, who was a zealous Independent. He was educated at Clare Hall, Cambridge. He was a preacher in 1661—attached apparently to the Presbyterian party in the Church of England, for at the Savoy conference (q.v.) he was present as an auditor on the Presbyterian side; but he submitted at once to the Act of Uniformity (1662), and in 1663 he was appointed to the rectory of Keddington in Suffolk, and almost immediately after was chosen preacher at Lincoln's Inn. In 1666 he published *The Rule of Faith*, in reply to a work by an English clergyman named Sargeant, who had gone over to the Roman Catholic church. He was made a prebendary of Canterbury in 1670 and dean in 1672. With Burnet he attended Lord Russell during his imprisonment for complicity in the Rye House Plot, and on the accession of William III rose high into favor. In March, 1689, he was appointed clerk of the closet to the King; in November, made dean of St. Paul's; and in April, 1691, was raised to the see of Canterbury, vacant by the deposition of Sancroft (q.v.), after vainly imploring William to spare him an honor which he foreboded would bring him no peace. Nor was he mistaken in his painful presentiment. The nonjuring party pursued him to the end of his life; but he bore their animosity without complaint or attempt at retaliation. A collected edition of his *Sermons*, in 14 volumes, was published after his death by his chaplain, Dr. Barker (London, 1694), and has been frequently reprinted. The best edition of his sermons and other works is by Dr. T. Birch, who also wrote his *Life* (London, 1752).

TILLY, JOHANN TSERKLAES, COUNT OF (1559–1632). A Catholic general in the Thirty Years' War, born at the Castle of Tilly, in Brabant. He received his military training in the Spanish armies, fought against the Turks in Hungary, and in 1610 was selected by Duke Maximilian of Bavaria to reorganize his army. At the outbreak of the Thirty Years' War (q.v.) he was placed in command of the forces of the Catholic League and on Nov. 8, 1620, won the battle of the White Hill, near Prague, which put an end to the short reign of Frederick of the Palatinate in Bohemia. He then carried on the struggle in the Palatinate, was defeated by Mansfeld and the Margrave of Baden-Durlach at Wiesloch (April 27, 1622), but gained a decisive victory over the latter at Wimpfen (May 6), and defeated Christian of Brunswick at Höchst (1622) and Stadtlohn (1623). For these services he was created Count of the Empire. He defeated Christian IV of Denmark at Lutter (Aug. 27, 1626), and coöperated with Wallenstein in bringing about the complete triumph of the Catholics in this second phase of the Thirty Years' War. When the influence of the League secured Wallenstein's retirement (1630), Tilly succeeded to the command of the Imperial forces, and took by storm the town of Magdeburg (May 20, 1631). The atrocities which the Croats and Walloons of his army perpetrated on this occasion form a stain upon a character that was remarkable in that age for honesty and loyalty to conviction. The capture of Magdeburg was Tilly's last triumph. Gustavus Adolphus completely routed him at Breitenfeld (Sept. 17, 1631). In April, 1632, the Swedish King forced the passage of the river Lech in Tilly's front after a desperate conflict, in which Tilly was mortally wounded. He was removed to Ingolstadt, where he died. Consult: Villermont, *Tilly* (Tournay, 1859); Klopp, *Tilly im Dreissigjährigen Kriege* (Stuttgart, 1861), both written from the Catholic point of view; and Wittich, *Magdeburg, Gustav Adolf und Tilly* (Berlin, 1874).

TIL'SIT. A town of Prussia, in the Province of east Prussia, on the left bank of the Memel or Niemen, 61 miles northeast of Königsberg (Map: Germany, J 1). It stands in a fruitful district, has broad streets, a cleanly appearance, and has paper, sugar, and oil mills, iron foundries, machine shops, distilleries, chemical establishments, breweries, and shoddy mills. It also gives its name to a pungent and popular cheese. Pop., 1900, 34,539; 1910, 39,013.

At Tilsit, on a raft in the middle of the Niemen, occurred, June 25, 1807, the celebrated meeting between Napoleon and Alexander I of Russia, following the defeat of the Russian forces at Friedland (q.v.). On July 7 peace was concluded at Tilsit between France and Russia and on the ninth between France and Prussia. The latter was stripped of her possessions west of the Elbe and of the Polish territories acquired in 1793–95, out of which Napoleon created the Duchy of Warsaw. Danzig was made a free city. Prussia joined the Continental System and closed its ports to English vessels. Its army was reduced to 42,000 men, and until the payment of a heavy indemnity a number of the chief strongholds were to remain in the hands of the French. A secret agreement between France and Russia provided for the imposition by force of the Continental System on Portugal, Austria, and the Scandinavian countries. Practically at Tilsit the French and Russian monarchs divided between them the mastery in Europe, France remaining the arbiter in west and central Europe, while Russia was given a free hand in Sweden and Turkey. Tilsit was occupied but later evacuated by the Russians in the Great War which began in 1914. See WAR IN EUROPE.

TIL'TON, JAMES (1745–1822). An American physician and army surgeon, born in Kent Co., Del. He studied at the University of Pennsylvania (M.D., 1771). He entered the Colonial army in 1775 as first lieutenant, becoming surgeon in 1776 and resigning in 1782 as senior hospital physician and surgeon. In 1780 Doctor

Tilton introduced with the best results a system of log hospital huts admitting free ventilation, and each accommodating only six patients. From 1783 to 1785 he was a delegate to the Continental Congress. As surgeon-general in the War of 1812, Tilton greatly improved the government medical service. He practiced first at Dover and later at Wilmington, Del.

TILTON, Theodore (1835–1907). An American journalist, poet, and novelist, born in New York. He graduated at the College of the City of New York in 1855, and was an editor of *The Independent* for most of the years between 1856 and 1871, and of *The Golden Age* (1871–74). In 1874 he brought criminal charges against the Rev. Henry Ward Beecher (q.v.), whom he accused of improper relations with his wife. Afterward he attracted attention as a platform speaker, chiefly in behalf of woman's rights. After 1888 he lived in Paris. His books include: *The Sexton's Tale and Other Poems* (1867); *Sancta Sanctorum, or Proof Sheets from an Editor's Table* (1869); *Tempest-Tossed*, a romance (1873); *Thou and I*, verses (1880); *Swabian Stories*, ballads (1882); *The Chameleon's Dish* (1883) and *Heart's Ease* (1894), volumes of verse; and *The Fading of the Mayflower: A Poem* (1906). His *Complete Poetical Works* appeared in 1897.

TIL WOOD. See Oreodaphne.

TIMÆ'US (Lat., from Gk. Τίμαιος, *Timaios*) (c.352–256 B.C.). A Greek historian, son of Andromachus, tyrant of Tauromenium, in Sicily. He was banished from Sicily by Agathocles, and passed most of his life in Athens. His chief work, a *History of Sicily* in 68, or, according to others, 38 books, embraced the period from the earliest times to 264 B.C. Polybius and others, notably Diodorus Siculus, pronounce him unfit for writing history on account of his "lack of critical acumen, malignity, and tendency to superstition." But, although most of these charges are founded on truth, Timæus's deficiencies have probably been exaggerated, since modern critics and most of the ancients praise his general knowledge and his accuracy in indicating the chronology of the events which he describes. He is said to have introduced the practice of recording events by Olympiads. Consult: Müller, *Fragmenta Historicorum Græcorum* (Paris, 1841); F. Susemihl, *Geschichte der griechischen Litteratur in der Alexandrinerzeit*, vol. i (Munich, 1891); J. B. Bury, *The Ancient Greek Historians* (New York, 1909); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part i (5th ed., Munich, 1911).

TIMARU, tē'mȧ-rōō; *colloq.* tĭm'ȧ-rōō. A seaport and agricultural port of entry on the main railway line between Christchurch and Dunedin, South Island of New Zealand (Map: New Zealand, S. I., C 5). It is the junction of the branch line by which tourists proceed to the alpine regions around Mount Cook. Flour and woolen mills and frozen-meat works are the chief industries. A concrete breakwater has made an efficient harbor at Timaru. Pop., 1911, 7927.

TIMBER (AS. *timber*, OHG. *zimbar*, timber work, room, Ger. *Zimmer*, room). In law, such trees as are suitable for building purposes. Timber trees belong to the owner of the land, both when standing and fallen, unless converted into lumber in a convenient form for transportation. Therefore timber will pass with the land under a conveyance, and is included in a mortgage on the land without being specifically mentioned. A sale of standing timber, the terms of which indicate an intention to pass title thereto at once, is considered a sale of realty, and must consequently be in writing to satisfy the Statute of Frauds; but if the title is not to pass until severance, the transaction is viewed as the sale of a chattel merely. A tenant is not legally entitled to cut more timber than is necessary for the purposes for which he hired the land, unless under special agreement. The term "timber" is also applied to large pieces of lumber suitable for the framework of buildings, bridges, etc., as distinguished from shingles, lath, etc. See Real Estate.

TIMBER. See Lumber Industry.

TIMBER AND TIMBER SUPPLY. See Lumber Industry.

TIMBERING. See Mining.

TIMBER PRESERVATION. See Forestry.

TIMBRE, tĭm'bẽr. See Clang Tint, Explanation of.

TIMBREL (derivation uncertain). An ancient musical instrument like a tambourine (q.v.), a tabor. In architecture, the same as tympanum (q.v.), but this use of the term is very rare.

TIMBUKTU, tĭm-bụk'tōō, or **TIMBUCTOO.** A town in the Timbuktu District of the Military Territory of the Niger, French West Africa, 9 miles north of the Niger (Map: Africa, D 3). The climate is unhealthful. The town, near the southern borders of the Sahara Desert, lies between a rolling table-land on the north and the swamps of the Niger. It has flat, windowless clay houses. It was largely in ruins when taken by the French. They have, however, introduced improvements, and new streets and European churches and schools have been constructed. Timbuktu is fortified. There is also a fortress at Kabara on the Niger. There are two important and handsome mosques. Timbuktu is notable for its commerce, and is the focus of the caravan trade in West-Central Africa. The annual value of the transit trade alone is put at $4,000,000. Gums and rubber are perhaps the leading articles. Gold, ivory, wax, salt, hardware, beads, and cheap cloth are also prominent items. The trade is chiefly by barter. The few local manufactures include cottons, leather articles, and pottery. French goods and money are replacing those of other countries. Timbuktu is a centre of Mohammedan learning and has a large Moslem library. The population, which has greatly diminished in recent times, is 5107. The town was founded in 1077 by the Tuareg tribe. It passed through different hands, began to be a place of commercial importance in the sixteenth century, and was seized by an army from Morocco in 1591. The Fulahs drove out the Moors early in the nineteenth century. Timbuktu was first visited by a European in 1826—Major Laing, an Englishman. From 1844 to 1846 it was again in the hands of the Tuaregs. In 1863 Ahmed el-Bathai drove out the Fulahs for the last time. The town passed into the possession of the French in 1894. Consult: Oskar Lenz, *Timbuktu* (2 vols., Leipzig, 1892); Félix Dubois, *Timbuctoo the Mysterious* (London, 1896); Toutée, *Du Dahomé au Sahara* (Paris, 1899); Lugard, *A Tropical Dependency* (London, 1905).

TIM'BY, Theodore Ruggles (1822–1909). An American inventor, born in Dover, N. Y. In 1841 he prepared a model of a revolving battery which he submitted to the military authorities in Washington, and from which he subsequently developed a metallic revolving fort to be used on land and water, and for this in 1862 he obtained a patent for a revolving tower for defensive and offensive warfare. In consequence of this patent he received a royalty of $5000 in 1862 for each turret constructed by the builders of the *Monitor*. His other inventions include a method for firing heavy guns by electricity (1861); a cordon of revolving towers across a channel (1862); a mole and tower system of defense (1880); a subterranean system of defense (1881); and a revolving tower and shield system (1884), for all of which he obtained patents.

TIME (AS. *tima;* connected with *tid*, OHG. *zit*, Ger. *Zeit*, time, Eng. *tide*, Skt. *a-diti*, boundless). In philosophy there has been even more difference of opinion as to the nature of time than of space (q.v.). In addition to the views of time which parallel those of space, there are still others about time on the part of thinkers who regard time as more fundamental than space in the constitution of the world. This way of regarding time as more real than space is almost inevitable in idealism (q.v.), and was taken by the first great idealist in modern philosophy, Bishop Berkeley. If the whole material world is nothing but ideas in minds, and if minds are conceived as immaterial and as not having spatial extension, it seems to follow that the apparent space in which the material world exists, being in a spaceless mind, cannot itself be what it seems. Thus Berkeley came to the conclusion, reënforced by considerations drawn from an associational psychology, that "neither distance nor things placed at a distance are themselves, or their ideas, truly perceived by sight . . . what he (any one) sees only suggests to his understanding that, after having passed a certain distance, to be measured by the motion of his body, which is perceivable by touch, he shall come to perceive such and such tangible ideas, which have been usually connected with such and such visible ideas." "As we see distance so we see magnitude. And we see both in the same way that we see shame or anger in the looks of a man. Those passions are themselves invisible." In the last analysis space is resolved into time with its suggestions. Ideas being in the mind are indeed in time, but not in space. But this time is not an independent entity; it is "*nothing*, abstracted from the succession of ideas in our minds," and it follows "that the duration of any finite spirit must be estimated by the number of ideas or actions succeeding each other in that same spirit or mind." When we say, then, that ideas are in time, we should not mean that they are contained in some medium which has an independent existence, but that they follow each other, and that the fact of this sequence is itself time. This position taken by Berkeley was one of unstable equilibrium, and subsequent idealists have endeavored in various ways to maintain a more secure poise. Some, like T. H. Green, have practically denied the ultimate reality of time altogether; consciousness, for which alone there is reality, is "an agent for the neutralization of time." This is the most common way of dealing with the difficulty, and results in the doctrine of the timeless Absolute. Another way out of the difficulty is taken by Josiah Royce, who makes time a fundamental character of the real world as experienced by the Absolute; the difference of before and after for the Absolute is just the same as that of before and after for us within the small span of the specious present. Just as we can hear at the same time several successive taps and experience their successiveness within the same moment, so the Absolute within his all-comprehensive span experiences immediately all the past and all the future at once, without, however, failing to experience their relative priority and posteriority. There is nothing future or past *to* his experience, but things are future or past *to one another for* his experience. Time is thus ultimately real. Royce claims that this is a justifiable extension to the Absolute Experience of what is an empirical fact in our finite experience; he has been criticized for failing to note that what makes temporal priority or posteriority in our experience is the order in which events *enter into* this experience: as into the Absolute Experience nothing *enters*, it is claimed that nothing can be experienced therein as temporal. For the Absolute the time order would not be essentially different from the space order or some other type of static order. This is a serious objection to any attempt to combine the reality of time with an idealistic absolutism.

Apart from idealistic interpretations, recent discussions of time have taken their departure from James's or Bergson's views. In his *Principles of Psychology*, James developed the thesis that "the sensible present has duration." "In short, the practically cognized present is no knife-edge, but a saddleback, with a certain breadth of its own on which we sit perched, and from which we look in two directions into time. The unit of composition of our perception of time is a duration, with a bow and a stern, as it were—a rearward and a forward looking end. It is only as parts of this duration block that the relation of succession of one end to the other is perceived. We do not first feel one end and then feel the other after it, and from the perception of the succession infer an interval of time between, but we seem to feel the interval of time as a whole, with its two ends embedded in it. The experience is from the outset a synthetic datum, not a simple one; and to sensible perception its elements are inseparable, although attention looking back may easily decompose the experience, and distinguish its beginning from its end. As we have seen, Royce infinitizes this specious present and gets the absolute experience, for which the whole future is as real as the whole past. James, on the contrary, insists on the *growth* of time; the future is not yet, not even for an absolute. Time "grows by finite buds or drops, either nothing coming at all, or certain units of amount bursting into being 'at a stroke.'" Real processes of change are not continuous but take place "by finite not infinitesimal steps, like the successive drops by which a cask of water is filled, when whole drops fall into it at once or nothing." This view, like Berkeley's, is in unstable equilibrium. If one emphasizes the durational character of the specious present with past and future included in it, one moves in one direction; if one emphasizes the discontinuous accretions of finite amounts of time, one moves in another. The former direction leads to the view of time as a continuum; the latter to time as a discrete somewhat. This latter view has been developed by Lovejoy.

James leaves no doubt as to his belief that the future is not yet real; but he is not equally clear about the past, although it would seem that the past also is on his view no longer real. Here Bergson parts company with James. The past is not left behind; it is not differentiated from the present by its status, but by its lesser efficacy. Time is likened to a snowball which, as it rolls onward, carries the snow over which it has traveled along with it. In reality the past is preserved by itself, automatically. In its entirety, probably, it follows us at every instant; all that we have felt, thought, and willed from our earliest infancy is there, leaning over the present which is about to join it, pressing against the portals of consciousness that would fain leave it outside.

While both the Bergsonian and the Jamesian doctrines of time claim to be purely empirical, and not based upon dialectical considerations, it is also claimed for them by their authors that they obviate the dialectical difficulties that have been raised against the reality of time. These difficulties are the Zenonian paradoxes. Zeno (q.v.) himself was probably arguing against the view of the discontinuity of time, but the recent philosophers who have made use of his arguments have turned them against the doctrine of the continuity of time. It is urged that if time is continuous in the sense that it is infinitely divisible, as there must be an infinity of points on a line of any length, it would take a correspondingly infinite number of moments to traverse all these points. But an infinite number of moments would be infinite time; but if it would take an infinite time to accomplish any result, the result could never be accomplished. As James states the argument, "That Achilles should occupy in succession all the points in a single continuous inch of space, is as inadmissible a conception as that he should count the series of whole numbers 1, 2, 3, 4, etc., to infinity and reach an end." Bergson returns again and again to the difficulties involved in such a view of time, and alleged to be insurmountable. But it would seem that the difficulty is factitious. One way of meeting the difficulty has been to say that if an inch of space be conceived as containing an infinite number of points, a minute of time can by a similar treatment be conceived as containing an infinite number of instants; and whatever instant be taken as correlated with any point, a last instant can be conceived as correlated with the last point, and when this instant is reached the line is traversed. Against this reply it is urged that the difficulty is not met by doubling it. An infinite number of instants of time cannot elapse any more than an infinite number of points can be traversed. Or as James puts it, the puzzle is not so much one involved in motion as in the flight of time itself. Unless time is composed of a finite number of indivisible moments, no smallest length of time can run its course until the infinite number of its constituent instants has been summated, i.e., it can never happen.

Argument upon such a basis is sophistical. The continuity of time does not mean that it is composed or aggregated out of an infinity of moments, but that any length of time is capable of being divided into any number you please of smaller lengths. Any division you make is a finite division; to say that the divisibility of time is infinite is not to say that time *is* actually infinitely divided, but that it *may be* divided as much as you please. But however much divided, the division actually made is always finite; the parts are of finite length, and a definite number of these definite parts makes up the total length you started to divide up. Any part of time you choose is always some length of time, and time is not composed of lengthless elements. In other words, if instant be defined as the temporal correlate of the spatial point, which has no length, breadth, or thickness, and thus is conceived as having no durational length, it is not a part of time. It is the termination of a length of time. It is the boundary between two adjacent lengths, but is a lengthless boundary. A length of time, then, say a minute, is not made up of an infinite number of lengthless instants, but is divisible into any number of correspondingly smaller lengths of duration, each terminating at the lengthless instant at which the next begins. If the passage of time be represented by spatial analogies, it may be illustrated, not by a *point* traversing a line composed of an infinite number of points, but by a short *line* traversing a longer line—a process which does not involve the perplexity in question. Such an illustration is more in keeping with James's own description of the "specious present" previously quoted; but this description must be amended in one point. Instead of saying that we "do not first feel one end and then feel the other after it, and from the perception infer an interval of time between," we should say that while both the prior and the posterior parts of the contents included in the span of the present are both felt together, we came first to feel the prior and then the posterior, just as, when a short line is traversing a longer, the part of the longer which is towards the rear of the moving line is as much spanned by the latter as is the part which is towards its front, and yet the former part entered into that span before the latter part. It was this failure to reckon both with the *entrance* of elements into the span of the present and with their *inclusion* within this span, that has led both James and Royce to their vagarious treatment of time, one in the case of the finite experience and the other in the case of the assumed Eternal Experience.

In its legal aspect, the meridian of the sun is the generally recognized standard of time; but where persons enter into legal relations expressly with reference to some arbitrary system, as that adopted by railroads for their convenience, the courts will apply the standard contemplated by the parties in case of a controversy. In computing a period of time from a certain day, the general rule is to exclude the first day and include the last day of the count. This rule may be disregarded if it will best effectuate the intention of the parties to an agreement. It is generally held that a policy of insurance includes the last day of the period named therein. In many States Sunday, or other dies non, is included in the computation of a number of days if they exceed a week, i.e., seven days, but excluded if less than seven days. In some States a dies non is included unless it would be the last day of a period. See DIES NON; MONTH; DAY.

In music, time is the division of a measure into the fractional parts of a whole note. The sign which indicates the character of the subdivision, and which consequently regulates the rhythm of the movement, is called the time signature. This is generally a fraction ($\frac{3}{4}$, $\frac{2}{4}$, $\frac{6}{8}$, etc.) placed after the clef at the beginning of a movement. In the fraction the lower figures represent the kind of notes to be used as time standards, while the upper figure shows how many of them are to be given in a bar. There are two general classes of time, duple and triple; in the former, the number of beats in a bar is divisible by two; in the latter, by three. Common time, so called, is $\frac{4}{4}$ and is represented by the sign C. Compound duple time and compound triple time differ only from their originals in that each beat (containing a dotted note or its equivalent) is divisible by three. See RHYTHM; TEMPO.

Consult: Herbert Nichols, *Psychology of Time* (New York, 1891); J. E. Boodin, *Time and Reality* (ib., 1904); James Arthur, *Time and its Measurements* (Chicago, 1909); Henri Bergson, *Time and Free Will*, Eng. trans. by F. L. Pogson (ib., 1910); Lovejoy, "The Problem of Time in Recent French Philosophy," in *The Philosophical Review* (Boston, 1912); McGilvary, "Time and the Experience of Time," in *The Philosophical Review* (ib., 1914); and the bibliography in the article SPACE.

TIME, EQUATION OF. See EQUATION OF TIME; NAVIGATION.

TIME, RECKONING OF. See DAY; HOUR; INTERNATIONAL DATE LINE; MONTH; TIME, STANDARD; YEAR.

TIME, STANDARD. The time in common use for regulating the ordinary affairs of life. It is derived from the sun. Leaving out of account small irregularities of the solar motion that are of no consequence for our present purpose, when that celestial body is on the meridian of any place we call the time at that place noon, or 12 o'clock. (See EQUATION OF TIME.) It follows that when it is noon at any given place it is similarly noon at all other places having the same meridian, and at places having different meridian it is either forenoon or afternoon. In fact, as the sun rises in the east and sets in the west, it is evident that when it is crossing the meridian of any place it must have already passed that of neighboring places to the eastward, and not yet have reached that of neighboring places to the westward. In other words, when it is noon in the given place it is already afternoon in places to the eastward, and still forenoon in places to the westward. The farther east one travels, the later is the local time; and this gives rise to the rather perplexing time differences so familiar to travelers.

In the case of railroads this matter of time differences has caused especially confusing complications. It was formerly customary for a road to use throughout large sections of its territory the local time of one of the principal cities through which it passed. The result was that when two railroads met in some smaller town, it happened not infrequently that they were running under widely different time systems. As many as five different kinds of time have been thus simultaneously in use in a single town.

TABLE OF THE WORLD'S TIME STANDARDS

COUNTRIES	Central meridian	Fast or slow on Greenwich
Great Britain, Faroe Islands, France, Belgium, Spain, Portugal, Gibraltar, Algeria, Morocco, Upper Senegal-Niger, Ivory Coast, Dahomey, Togoland, São Thome and Principe Islands	0°	0 h.
Norway, Sweden, Denmark, Luxemburg, Germany, Austria-Hungary, Switzerland, Italy, Malta, Montenegro, Bosnia, Tunis, French Equatorial Africa, Cameroons, Belgian Congo, Angola, German Southwest Africa	15° E.	1 h. fast
Rumania, Bulgaria, Turkey (railways), Egypt, German East Africa, Mosambique, British South Africa	30° E.	2 h. fast
Uganda, British East Africa	37½° E.	2½ h. fast
Aden, Somaliland, Madagascar	45° E.	3 h. fast
Mauritius, Seychelles, Réunion	60° E.	4 h. fast
Chagos Archipelago, Portuguese India	75° E.	5 h. fast
India (Bombay, Madras), Ceylon, French India	82½° E.	5½ h. fast
India (Calcutta)	90° E.	6 h. fast
Burma	97½° E.	6½ h. fast
Straits Settlements, Indo-China	105° E.	7 h. fast
Hongkong, Macao, Eastern China, Formosa, *Philippines*, British Borneo, Labuan, Portuguese Timor, West Australia	120° E.	8 h. fast
Japan, Korea	135° E.	9 h. fast
Guam, Northern Territory, South Australia	142½° E.	9½ h. fast
Queensland, New South Wales, Victoria, Tasmania, German New Guinea	150° E.	10 h. fast
New Caledonia, New Hebrides	165° E.	11 h. fast
New Zealand	172½° E.	11½ h. fast
Iceland, Madeira, Senegal, Portuguese Guinea, French Guinea, Sierra Leone	15° W.	1 h. slow
Cape Verde Islands, Azores, Fernando da Noronha, Trinidad (Brasilian)	30° W.	2 h. slow
Eastern Brasil	45° W.	3 h. slow
Prince Edward Island, Nova Scotia, Sainte-Pierre and Miquelon, *Porto Rico*, Lesser Antilles, French Guiana, British Guiana, Amasonas (Brasil)	60° W.	4 h. slow
New Brunswick, Quebec, Eastern Ontario, *Eastern United States*, Bahamas, Jamaica, Canal Zone, Peru, Acre (Brasil), Chile	75° W.	5 h. slow
Western Ontario, Manitoba, *Central United States*, Honduras, British Honduras	90° W.	6 h. slow
Saskatchewan, Alberta, *Mountain United States*	105° W.	7 h. slow
British Columbia, *Pacific United States*	120° W.	8 h. slow
Alaska, Yukon	135° W.	9 h. slow
Tahiti	150° W.	10 h. slow
Hawaii	157½° W.	10½ h. slow
Samoa	172½° W.	11½ h. slow

The establishment of an international standard of time appears to have been first suggested by Charles Dowd, of Saratoga Springs, in 1870.

In 1879 the question was raised anew by Mr. (afterward Sir) Sandford Fleming (q.v.), chief engineer of the Canadian Pacific Railway, and through his efforts was brought to the attention of the leading governments of the world, with the result that in 1882 the United States Congress passed a joint resolution authorizing the President to call an international conference to fix and recommend for universal adoption a common prime meridian to be used in reckoning longitude, and in the regulation of time throughout the world. The conference assembled in Washington, Oct. 1, 1884. Delegates representing 26 countries were present, but they were not able to agree unanimously upon a prime meridian. However, most of them favored the adoption of Greenwich, England, as the origin of longitudes. The French delegates represented the only important nation that would not agree, and it was not until March 10, 1911, that France abandoned the use of the meridian of Paris and adopted that of Greenwich as its prime meridian.

When the Prime Meridian Conference met, the United States and Canada had already selected a series of standard meridians, differing in longitude from that of Greenwich, England, by exact multiples of 15°. On Oct. 18, 1883, a convention was called by W. F. Allen, Secretary of the General Railway Time Convention, which decided on the introduction of standard time to take effect at noon on Nov. 18, 1883, and the change was made without difficulty. Now 15° of longitude corresponds exactly to one hour of time difference, and therefore the local times of the several standard meridians differ from Greenwich by an even number of hours without fractional minutes and seconds. In the United States the standard time meridians are those whose longitudes are west of Greenwich 60°, 75°, 90°, 105°, and 120°. The times of these meridians are respectively 4 hours, 5 hours, 6 hours, 7 hours, and 8 hours slow on Greenwich time. The time of the 60th meridian is called Colonial, that of the 75th meridian Eastern, that of the 90th Central, that of the 105th Mountain, and that of the 120th Pacific time. The limiting lines of the time zones have been so drawn arbitrarily that they never divide any town. Where such a division is theoretically unavoidable, the dividing line for actual use is drawn on the map with a crook in it, so as to put the whole town on one side of the line.

Most of the countries throughout the world now use standard time based on one of the even hour meridians as reckoned from Greenwich. In a few cases, however, it is found more convenient to use the even half-hour meridians. Belgium and Holland were the first continental nations to follow the example of the United States in introducing the zone system, and other countries fell rapidly into line. (Brazil established four time zones in 1913.) Of the countries of Europe, only Ireland, Holland, Russia, and Greece hold aloof, and base their time systems on the meridians of their respective capitals (except in the case of Russia, where Pulkowa time is used on the railways), Holland having abandoned the meridian of Greenwich for that of Amsterdam on May 1, 1909.

Consult: Harold Jacoby, *Practical Talks by an Astronomer* (New York, 1902); W. F. Allen, *Short History of Standard Time* (Philadelphia, 1904); H. H. S. Cunynghame, *Time Clocks* (New York, 1906). See CLOCK; DAY; HOROLOGY; INTERNATIONAL DATE LINE; MONTH; TIME SIGNALS.

TIM'ELI'IDÆ (Neo-Lat. nom. pl., from *Timelia*, from the East Indian name). An assemblage of passerine birds resembling thrushes in a general way, which has been formed as a sort of catch-all to contain many genera difficult of definite assignment elsewhere. All are birds of the Old World, and most of them belong to the Oriental and Ethiopian regions, and are denizens of woods, jungles, and rough mountains. The most distinctive timeliines, perhaps, are the babbling thrushes of the genera *Timelia*, *Pomatorhinus*, *Orthonyx*, and their allies, and the hill robins of the genus *Liothrix*.

A TIMELIINE TYPE.

The slaty-headed babbling thrush (*Pomatorhinus schisticeps*) of the Himalaya Mountains.

TIME OF ADVENT. See ADVENT.

TIMES, THE. A famous daily newspaper of London, England. Its publication really began Jan. 1, 1785, with the first number of the *London Daily Universal Register*, the present name being first applied to the issue of Jan. 1, 1788, by its founder, John Walter (1735–1812). The paper was, up to 1908, managed and controlled by the descendants of the first John Walter, his successors being John Walter (1776–1847), John Walter (1818–94), and Arthur Fraser Walter (1846–1910). Under their skillful management, with the assistance of some of the ablest journalists the world has known, the *Times* has achieved a reputation for unequaled journalistic enterprise and unusual political influence. It has also been a pioneer in the adoption of new inventions in printing and publishing. Among improvements of the latter sort, one of the greatest was the introduction of steam printing presses, the use of which was begun with the issue of Nov. 29, 1814, in spite of strong opposition from the employees. Subsequently experiments in the *Times* office led to the perfection of stereotyping, to the introduction of the Walter press, from which by the use of stereotype plates the paper was printed on both sides by a single operation, and to important improvements in folding, stitching, and typesetting machines. A farther improvement was the introduction of the Wicks Rotary Type-casting Machine in 1899.

For the first few years of its existence the *Times* was edited and managed solely by the two Walters—father and son. Its outspoken criticism of the King and his Ministers during this period drew down on the proprietors the wrath of the government, and as a result they were several times fined and imprisoned in Newgate. Several attempts were likewise made to hamper or suppress their foreign news service, but this department of the paper had been carefully and systematically developed with the result that the news of Trafalgar and Waterloo and other notable victories of the British arms were published in London before the arrival of the official dispatches.

For some time prior to 1816 the *Times* was edited by Sir John Stoddart. In the latter year the editorial control was intrusted to Thomas Barnes. He was assisted as a leader writer by Edward Sterling, whose virile articles earned for it the name of "The Thunderer." For a period of 36 years—from 1841 to 1877—the editor was John Thaddeus Delane (q.v.), one of the greatest of English journalists. He was succeeded in turn by Thomas Chenery, upon whose death in 1884 George Earle Buckle became editor. The influence and position of the *Times* rank it as having been for nearly a century unquestionably the leading paper of the British Empire. It has remained independent of party and has consistently favored a strong foreign policy and a constant strengthening of the ties between the mother country and the colonies. It supported in turn Beaconsfield's stand on the Eastern question and Gladstone's Egyptian policy. When, however, the latter adopted the idea of Home Rule for Ireland, the *Times* withdrew its support, was an active factor in the promotion of the Liberal-Unionist party, and contributed largely to the defeat of the Home Rule bills. It was in the course of this campaign that it made one of its few great blunders in the publication of the famous Pigott forgeries, known as "The Parnell Letters." It supported Salisbury's ministry in its South African policy in 1899–1902, although it vigorously criticized the conduct of the war after it had begun. In addition to its daily issue the *Times* publishes a tri-weekly, known as the *Mail*, a weekly edition (1877–   ), a weekly *Literary Supplement* (1901–   ), and other periodical supplements concerned with law, commerce, engineering, education, and finance. Supplements on Russia, South America, etc., have been republished in volumes. It has published also an *Atlas* (first edition, 1895) and a *Gazetteer*, and in 1898 undertook a reprint of the *Encyclopædia Britannica*, which, with the subsequently published supplementary volumes, constitutes the tenth edition of that work.

Two other notable invasions of the book field were represented by M. Busch, *Bismarck: Some Secret Pages of His History* (published for the *Times* by Macmillan, London, 1898), and *The Times History of the War in South Africa* (completed in 6 vols., ib., 1909). In 1908 an epoch in the history of the *Times* was made when the paper passed into the hands of a stock company financially controlled by Lord Northcliffe (Alfred Charles William Harmsworth). Mr. A. F. Walter (1846–1910), who had been chief owner since 1891, then became chairman of the board of directors and Mr. C. Moberly Bell (1847–1911) became managing director. In 1910 Mr. A. F. Walter's son, John Walter (1873–   ), took his father's place. In 1912 Mr. Geoffrey Robinson became editor of the *Times* and director of the Times Publishing Company. In the period before the Great War, the *Times* steadily urged a larger army, and more complete preparations for defense, and pointed out the grave danger of an attack on the British Empire by Germany. It criticized the conduct of the war, and did much to bring about the coalition ministry, May, 1915. In common with other newspapers, the *Times* was unable under a rigid censorship to anticipate the official publication of war news. Consult: *Progress of British Newspapers in the 19th Century* (London, 1901); S. V. Makower, *Some Notes Upon the History of the Times, 1785–1904* (Edinburgh, 1904); A. I. Dasent, *John Thaddeus Delane* (2 vols., ib., 1908); and Sir E. T. Cook, *John Delane*, in "Makers of the Nineteenth Century Series" (New York, 1915). See also NEWSPAPER.

TIMES, THE (NEW YORK). See NEWSPAPER.

TIME SIGNALS. Signals used for the accurate regulation of clocks and watches. In the United States time signals are based on astronomical observations made at the United States Naval Observatory in Washington. These observations enable the astronomers there to keep their standard clock regulated; and from this clock a daily noon signal is sent out by electric telegraph to the Western Union Telegraph Company. This company in turn uses the observatory signal to regulate its standard clock, from which accurate time is distributed telegraphically to the public. Various persons, jewelers, and others, who are subscribers to the Western Union time service, receive signals electrically, and are thus able to keep their own standard clocks correct. In certain places a time ball is let fall exactly at noon by means of an automatic electric signal from the telegraph company, and the public are enabled to regulate watches and clocks. In England an analogous time service is furnished from the Royal Observatory at Greenwich; and other European countries, such as France and Germany, have similar arrangements in successful operation. Thus the direct determination of time by actual astronomical observation has been rendered unnecessary on the part of jewelers and nautical instrument makers. These latter were formerly compelled to observe time stars themselves with small transit instruments (q.v.), in order to regulate the chronometers of vessels about to put to sea.

In the most recent development of time signaling wireless telegraphy is used. In 1908 the Bureau des Longitudes suggested the advantages to be derived from a series of hourly wireless signals from the Eiffel Tower for the determination of longitudes. The service was first put into operation in 1910. Soon afterward other stations began to send out signals by wireless telegraphy, and the possibility of confusion arising from the overlapping of signals from different stations led the French government to call an International Conference for the regulation of the whole question. The conference met in 1912, and formulated a scheme whereby wireless signals would be sent out on the even hours of Greenwich time, the entire work being shared by 10 or 12 stations situated in widely scattered parts of the globe. The scheme went into effect on July 1, 1913, but, on account of the European war, was suspended.

TIME STUDY. A process of analytical determination and record of manual, mechanical, or other operations, used by the practitioners of Scientific Management (q.v.) to fix standards of performance and remuneration. Its successful prosecution demands specially-trained observers, the coöperation of the workers under observation, and the use of the stop-watch. By resolving the operation into its elements and measuring them separately, those parts of the cycle which are variable in time requirement may be identified and separated from those which are fixed; delays may be detected and measured, their extent determined, and their causes discovered; units may be isolated for reassembly in other combinations, and a definite and exact knowledge may be put in the place of the general intuition or experience which, under the older fashion of management, formed the basis of an estimate, or a more or less assured guess at the total time in a lump.

TIME-TABLE. See Railways.

TIM'GAD. The site of *Colonia Marciana Trajana Thamugas*, a town founded by Trajan 100 A.D. and named from his sister. It was a fortified post on the road between Theveste and Lambaesis or Lambaesa (see Lambessa). It is in the department of Constantine, Algeria. It preserves the military plan of the outpost which it replaced, in its two main streets, *Decumanus Maximus* and *Cardo Maximus*. Originally laid out as a rectangle, 357 m. by 324 m., with eleven streets intersecting at right angles, as the town expanded in the second and third centuries, the new streets gave up this regularity. Monotony was avoided by colonnades along the main streets and fountains at many corners. The main entrance to the town was from the northern end of the *Cardo Maximus*. Inside the gate, on the left, was a bath, and, one block from the Forum, a library erected by a citizen at a cost of 400,000 sesterces. The Forum, which was entered from the Cardo, through a monumental gate, is a rectangle, 50 m. by 43 m., surrounded by porticoes. On its western side are the Curia and a temple. Much of the eastern side is occupied by the basilica, to the north of which was the public toilet. South of the Forum is the theatre, dating from the second century. It accommodated 3500 people. While the simple dwellings recall those of Pompeii by their plain exteriors, they differ from them internally. Instead of an atrium there is often a court, much like a patio, paved and supplied with a fountain. Sometimes one house occupied a whole block. The majority were supplied with water, and, when more luxurious, with baths. Except the public and private baths the buildings were not heated, which is astonishing when one recalls that in Italy such comforts were common. Of the public baths the most imposing, 80 m. long by 66 m. wide, was located just outside the northern gate of the city; it contained over 30 halls. Besides the public or city baths were those established by individuals or societies, such as those called *Filadelfes*. The capitol, situated to the southwest of the original limits of Timgad, is almost entirely destroyed; but its dimensions, 53 m. by 23 m., indicate that the structure was imposing in appearance. The building was of the Corinthian order, with six columns along the front and colonnades along the side. Around it was a great court with porticoes. Throughout the town many inscriptions and statues have been found.

In the third century the town had become Christianized, and in the fourth it was an important centre for the Donatists. From the time of its foundation the city apparently prospered, but, as the Roman Empire declined in the fourth century, Timgad too declined. The city suffered also through the invasions of Vandals, Byzantines, and Arabs. The life of the city in fact terminated with the appearance of the Arabs. From then until the nineteenth century—except for stray visitors—the town was unnoticed. In 1881 the *Service des Monuments historiques* undertook to clear the site. After some interruption the work was resumed in 1892 and then carried on regularly with the result that Timgad may justly be called the African Pompeii. Besides the structures named above there are two triumphal arches, one in honor of Trajan. Consult: Albert Ballu, *Guide illustré de Timgad* (2d ed., Paris, 1911); id., *Les ruines de Timgad: sept années de découvertes*, 1903–10 (ib., 1911); and W. Cart, "Timgad, la Pompeii Algérienne," in *Bibliothèque universelle* (ib., Nov. and Dec., 1915).

TIM'OCLES (Lat., from Gk. Τιμοκλῆς, *Timoklēs*) (4th cent. B.C.). An Athenian comic poet, belonging to the Middle Comedy, noted for his pungent style and for his attacks on Demosthenes. Consult T. Kock, *Comicorum Atticorum Fragmenta*, vol. ii (Leipzig, 1886).

TIMO'CREON (Lat., from Gk. Τιμοκρέων, *Timokreōn*). A Greek lyric poet of the early fifth century B.C., born at Ialysus, in Rhodes. His works are lost, but his name has survived through his hatred for Themistocles, whom he bitterly attacked. The statesman was defended, however, by his friend Simonides, whose sarcastic epigram on Timocreon's gluttony and bibulous habits has been preserved by Athenæus. He excelled in drinking songs, to which he gave a satiric tone. Fragments are in Bergk, *Poetæ Lyrici Græci*, vol. iii (5th ed., Leipzig, 1914).

TIMOFEYEFF, Yermak. See Yermak Timofeyeff.

TIMO'LEON (Lat., from Gk. Τιμολέων, *Timoleōn*) (c.394–337 B.C.). A Greek general, the liberator of Sicily from the dominion of Dionysius the Younger. He was born at Corinth, of a noble and illustrious family. In battle he saved his brother Timophanes' life at the risk of his own, but, when Timophanes attempted to overthrow the democratic form of government at Corinth and make himself sole tyrant, Timoleon brought about his brother's death and the reëstablishment of the old constitution. Just after this event, and while the Corinthians were still deliberating with regard to the act, in 344 B.C., an embassy arrived at Corinth from Syracuse in Sicily, a colony of Corinth, requesting the aid of the Corinthians in the civil dissensions in the island. A force was sent to assist the Syracusans, with Timoleon at the head. In Sicily at this time Hicetas and Dionysius the Younger were both striving to obtain the supremacy in Syracuse (q.v.). The force commanded by Timoleon was small, but in a short time he drove both of the would-be tyrants from the city. After repeopling the almost desolate city by recalling the exiles, and inviting new colonists from Greece, Italy, and Sicily, he spent the next two years in enacting laws and organizing a constitution, which he put on a completely democratic footing. The Carthaginians, alarmed at the reviving power of Syracuse, and the prospect of union among the Sicilian Greeks, now sent an army of 80,000 men under Hasdrubal and Hamilcar to subdue the whole island. Timoleon, with only 12,000 men, encountered them (339 B.C.) on the Crimissus, and gained one of the greatest victories ever won by Greeks over barbarians. He now proceeded to free the other Greek cities from the rule of the tyrants, and made a treaty with the Carthaginians, whereby the Halycus River was fixed as the boundary between the Greek and the Carthaginian dominions in Sicily. Hicetas was driven from Leontini, and Mamercus from Catana, and free constitutions were conferred upon all the Greek cities in Sicily. After his great work was accomplished Timoleon lived as a private citizen at Syracuse, respected and honored, until his death. He was buried in the market place of Syracuse, where a Gymnasium, called the Timoleonteum, was afterward erected over his tomb. Consult Plutarch's *Life of Timoleon*, the standard histories of Greece, and E. A. Freeman, *History of Sicily* (Oxford, 1891–94).

TI′MON (Lat., from Gk. Tίμων), called THE MISANTHROPE. A native of Athens, who lived at the time of the Peloponnesian War. The little that is known concerning him is learned chiefly from Aristophanes and the other comic poets of the period, and from Lucian, who made him the subject of one of his best-known dialogues. Disgusted with mankind, on account of the ingratitude of his early friends and companions, he lived a life of almost total seclusion from society, the only visitor whom he would receive being Alcibiades. Shakespeare's *Timon of Athens* has as its ultimate source Lucian's dialogue.

TIMON OF ATHENS. A tragedy produced in 1607 or 1608, printed in 1623, of which Shakespeare wrote only the chief scenes, and which another, possibly Wilkins, finished; or perhaps Shakespeare's remodeling of an old play. The sources are the story of Timon told in the life of Antony in North's *Plutarch* and in Painter's *Palace of Pleasure*, and used by Boiardo in his comedy *Il Timone.*

TIMON OF PHLI′US. A Greek poet and skeptic, who lived at Athens about 275 B.C. He wrote numerous works in both prose and verse. The most celebrated of his poems were the three books of Σίλλοι, in which, in the form of a parody of Homer's epic poetry, he ridicules the tenets of all dogmatic philosophers, living or dead, from the skeptic's point of view. Like the classic satire of Rome, these pieces were written in hexameter verse and, according to the testimony of the ancients (Diog. Laërt. ix. 12, 109–115; Euseb. Praep. Ev. xiv. p. 761), were excellent productions of their kind. The fragments are published in Wölke, *De Græcorum Syllis* (Warsaw, 1820); Paul, *Dissertatio de Sillis* (Berlin, 1821); and Wachsmuth, *De Timone Phliasio Ceterisque Sillographis Græcis* (Leipzig, 1885).

TIMOR, tē-mōr′. The largest and most southeasterly of the Lesser Sunda Islands, situated 330 miles southeast of Celebes and 700 miles east of Java, between which and Timor the main chain of Lesser Sunda Islands intervenes (Map: Australasia, E 3). It has an extreme length from northeast to southwest of about 280 miles, with an average breadth of 55 miles, and an area estimated at 12,593 square miles. The coasts are for the most part steep, lined with coral reefs, and difficult of approach. The interior is not well known. It is traversed by a forest-covered mountain range, and the geological formation seems to be a core of slate, diorite, and serpentine flanked by beds of carboniferous limestone, Triassic sandstone, and some Tertiary formations. The mineral wealth is considerable, but unexploited. The climate is hot and unhealthful on the coast, and the rainfall is very slight, especially in the south. The flora and fauna are less varied than in the other East Indian islands, and the island forms a transition region between these and Australia. The resources of the island are not developed; agriculture is primitive, and the exports are few and small in quantity, coffee, wax, and a little sandalwood being the chief staples. Politically the island is divided nearly equally between Holland and Portugal, the latter possessing the northeastern half, with the seat of government at the small town of Deli or Dilli. The Dutch portion forms the principal member of the Residency of Timor, which includes also the islands of Rotti, Savu, and Sumba, eastern Flores, and the Solar and Allor groups. The capital of the Residency is Kupang, a town of about 8500 inhabitants at the southern extremity of the island. The inhabitants of the island are mainly Papuans with some intermixture of Malays and Chinese. The Portuguese estimate the population of the part of the island controlled by them at 300,000, and the Dutch estimate the population of their part at 308,500. The number of Europeans in the entire Dutch Residency was only 372 in 1905. Consult: Wichmann, *Sammlungen des Geologischen Reichmuseum* (Leyden, 1881–84); A. Bastian, *Indonesien* (Berlin, 1885); H. O. Forbes, *A Naturalist's Wanderings in the Eastern Archipelago* (London, 1885).

TIMORLAUT, tē-mōr′lout, or TENIMBER. A group of coralline islands in the East Indian Archipelago belonging to the Dutch Residency of Amboina, and situated between the Banda and Arafura seas, 240 miles southeast of the island of Ceram in the Moluccas and about midway between New Guinea and the Lesser Sunda Islands (Map: Australasia, F 3). It consists of the large islands of Yamdena (1151 square miles), Larat, a volcanic island, and Selaru, and a number of smaller islands, with a total area of about 2096 square miles. The large islands are hilly and forested, rising to a height of about 1000 feet, while the others are low and flat, and of coral formation. The inhabitants, a mixture of Malays and Negritos, are engaged in primitive agriculture, cattle raising, and trepang fishery. Pop., about 25,000.

TIMOTE, tē-mō′tā. A group of small tribes apparently constituting a distinct linguistic stock, whose modern representatives still occupy the mountainous district of Mérida, southward from Lake Maracaibo, in western Venezuela. In former times they usually went naked, with their bodies painted red, and were agricultural, cultivating corn, chile, and various edible roots. They buried their dead in caves or in underground vaults, depositing with the corpse sacred figurines of clay. Consult: Ernst, in *Zeitschrift für Ethnologie* (Berlin, 1885); José Ignacio Lares, *Resumen de las Actas de la Academia Venezolana, 1886* (Carácas, 1886); D. G. Brinton, *The American Race* (New York, 1891).

TIMOTHEUS, tĭ-mō′thē-ŭs (Lat., from Gk. Τιμόθεος), OF MILETUS (c.450–c.357 B.C.). A Greek poet and musician, son of Thersander. He was first of all a citharodes—one who, while singing, played his accompaniment on the cithara. The form of lyric poetry used for these performances was the *Nomos*, whose name Terpander was said to have established. Originally this was a musical performance of hexameters from the epic, but Timotheus gave definite form to novelties already attempted, and greatly increased artistic display by introducing a free metrical structure, giving full scope for elaborate composition and vocal execution. He enlarged his opportunities by increasing the number of cithara strings to 11. His innovations met with strong opposition, and were distasteful to the Spartans, against whom he defends himself in his "Persians." His works have till recently been known only through scanty fragments and allusions, but in 1902 a papyrus manuscript of his nomos, the "Persians," was discovered by the German Oriental Society in a Greek sarcophagus at Abusir, near Memphis, in Egypt. About 116 lines of considerable length are preserved, and 80 of these are practically complete. It is the oldest Greek manuscript yet found and was copied but a few years after the death of the author, and the fact that it is the only specimen of this branch of the Greek lyric lends special value to the poem. The subject is the defeat of the Persians at Salamis, and it seems to belong to the early years of the fourth century, when Athens was humbled and Sparta supreme, for in the vivid description of the battle there is no mention of Athens. The dialect, however, is the Attic of the poets. Timotheus seems to have been less a poet than a musician, and with only his libretto it is scarcely possible to estimate properly his real position in Greek literary art. Consult: U. von Wilamowitz-Möllendorf, *Timotheos, Die Perser* (Leipzig, 1903), text, a Greek paraphrase, and explanatory essay; *Der Timotheos Papyrus* (ib., 1903), photographic facsimile; Reinach and Croiset, in *Revue des études grecques*, vol. xvi (Paris, 1903), an essay and translation into French; W. C. Wright, *A Short History of Greek Literature* (New York, 1907); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i (6th ed., Munich, 1912). For the nomos or nome, see H. W. Smyth, *Greek Melic Poets* (New York, 1900).

TIM'OTHY (Gk. *Τιμόθεος*, *Timotheos*, honoring God). One of the assistants of the Apostle Paul. Our most reliable information regarding Timothy is that contained in the undoubted Epistles of Paul and in Acts. The credibility of what is said or implied about him in the Epistles to Timothy depends on the character of those Epistles (q.v.). He was a native of Lystra, in Lycaonia, the son of a Gentile father and a Jewish mother (Acts xvi. 1). The circumstances of his conversion are unknown. On Paul's second visit to Lystra Timothy was already favorably known in the neighborhood as an active Christian. Paul persuaded him to go with him as an assistant. To avoid unnecessary offense to the Jews, he was circumcised (Acts xvi. 2–3). These statements of Acts may be supplemented by those in 2 Tim. iii. 15, i. 5; 1 Tim. i. 8, iv, 14. From this time until the close of Paul's life Timothy was one of his most faithful, trusted, and intimate disciples. He was intrusted several times with important missions to the churches founded by the Apostle. At Berea (Acts xvii. 14), Athens, and Thessalonica (1 Thess. iii. 1–6), at Corinth, and later at Ephesus (1 Cor. iv. 17, xvi. 10), and again in Macedonia (Acts xix. 21–22) he rendered important services, and is joined with himself by Paul in the addresses of several of his epistles. His important and delicate mission to Corinth, however, seems to have resulted unfavorably (see CORINTHIANS, EPISTLES OF PAUL TO THE). Though he went to Jerusalem with Paul (Acts xx. 4), he was probably engaged in labors elsewhere when the Apostle embarked on his voyage to Rome. He visited his master at Rome (see the opening words of Philippians, Colossians, and Philemon), and was probably sent by Paul, shortly before his release, with a message to Philippi (Phil. ii. 19). According to the usual interpretation of 1 and 2 Timothy, after the Apostle's release he joined Timothy in the East, and later left him in charge at Ephesus in a position full of great responsibility. In his anxiety Paul wrote him the letter of advice and warning known as 1 Timothy. When Paul was imprisoned the second time, and probably not long before his death, he wrote 2 Timothy, summoning his beloved disciple to come to him as quickly as possible. At some later date Timothy himself was arrested, but afterward released (Heb. xiii. 23). According to tradition he passed the remainder of his days as Bishop of Ephesus.

TIMOTHY AND TITUS, EPISTLES TO. Three New Testament letters, often designated the Pastoral Epistles. These three epistles form a group by themselves, in that they are very similar to each other in general character, style, and vocabulary, and seem to have been occasioned by the same general situation and written by the same author.

1 Timothy, purporting to be from Paul to his younger disciple and associate Timothy, opens by Paul reminding Timothy that he had left him in Ephesus to combat teachings that were opposed to the gospel as Paul taught it (i. 1–17). Specific directions on various points of church order follow. Timothy is to see that these are obeyed (i. 18–iii. 16). Reverting to the subject of heretical teachers, Timothy is urged to exercise the most careful watch over his own conduct that it may be exemplary in every respect (iv. 1–v. 2). Special instructions follow as to how to deal with certain specified classes in the Church (v. 3–vi. 2). Turning once more to the subject of the false teachers, especially those who are actuated by the love of money, Paul urges Timothy to courageous and loyal devotion to his Master Jesus Christ (vi. 3–21). Only a brief benediction (in which "you" is plural), with no salutations, closes the letter.

The Epistle to Titus is briefer but quite similar to 1 Timothy. After a rather long introduction (i. 1–4) the letter explains that Titus had been left in Crete to complete the organization of the Church there (i. 5), in particular, to install elders or bishops, whose qualifications are stated (i. 6–9; cf. 1 Tim. iii. 1–8). The generally low-minded character of the Cretans and the presence of false teachers make this more necessary (i. 10–16). Titus is next advised as to how he should conduct himself towards different classes (cf. 1 Tim. v. 3–vi. 2) as is required by the nature of the Christian salvation (ii. 1–15). Titus is next urged to teach his people to practice the principles of morality in all their relations in life (iii. 1–8), avoiding heretical opinions and persons (iii. 9–11). Personal directions to Titus, salutations, and a benediction close the letter (iii. 12–15).

2 Timothy has more decidedly the appearance of a private letter. The first section, full of exhortation to Timothy to be faithful to his

trust, closes with a reference to the Apostle's own suffering for the faith, his treatment by enemies, and his gratitude for the kindness shown by Onesiphorus (i. 1–14). Timothy is urged to be courageous, earnest, and faithful in administering his charge (ii. 1–13). Against all false teaching and teachers he is to take a firm stand (ii. 14–19), insisting by word and example that the test of true doctrine is sound morality (ii. 20–26). The last times, full of hardship and wickedness, are at hand (iii. 1–9); but, like Paul himself, Timothy must remain loyal and manfully endure persecution (iii. 10–iv. 5). Paul expecting his end to come soon, and deserted by many, summons Timothy to come to him (at Rome?), adding certain minor requests (iv. 9–15) and a reference to his trial and prospect of martyrdom (iv. 16–18). Salutations, information, greetings, and a benediction close the letter.

The Pauline authorship of the Pastoral Epistles is questioned by many scholars, and for reasons that cannot be called arbitrary. It is generally admitted that the problem is a serious one, even by those who still hold the traditional opinion. No one who has made a close study of the remaining 10 Pauline Epistles, has become fairly familiar with their thought and style, and has gained from them to some extent a familiarity with the Apostle's mind, can read the Pastorals without being conscious that here he has something different—a different habit of thought, vocabulary, point of view, and set of interests, which even the presence of the name of Paul in the letters and the many personal allusions do not avail to offset. Briefly, these differences between the Pastorals and the Epistles accepted as Paul's (and our knowledge of Paul derived from Acts) may be specified as follows: (*a*) the character of the church organization; (*b*) the nature of the heresies combated; (*c*) the situation (or situations) in which Paul and those addressed are placed; (*d*) the literary character of the Pastorals, especially their vocabulary; (*e*) the general character of the Christianity of the Pastoral Epistles. In the earlier stages of criticism it was on the first two of these points that the chief emphasis was laid. But to-day it is quite freely admitted, on the one hand, that we know very little about the details of the church organization of the apostolic age or of the nature of early heresies, and, on the other, that on these matters the statements of the Pastorals, interpreted fairly, do not necessarily imply a post-Pauline date. It is otherwise, however, with the last three points. No known period of the Apostle's life presents the situation required by these Epistles. Usually it has been held that 2 Timothy implied a second imprisonment of Paul at Rome, and consequently 1 Timothy and Titus belonged to a period of missionary activity between the first imprisonment (where the record of Acts ends) and a second one, known only from vague tradition. This is possible, but cannot be proved. But even on this supposition the movements of Paul and his companions are anything but clearly discerned from these letters, and it is most difficult to construct a consistent picture of the situation. To say the least, this creates a suspicion that the letters may not be genuine letters of Paul. The last two points (*d*) and (*e*) are, however, the ones that seem most decisive against the Pauline authorship. The vocabulary of the Pastorals is strikingly un-Pauline, containing a remarkably large number of words not used in the other Pauline Epistles and omitting many characteristically Pauline words or expressions where such would be expected to occur. This feature of an un-Pauline character of the language is so deeply stamped upon these letters that the supposition of Pauline authorship (even on the hypothesis of a different amanuensis) is almost impossible. The general character of the Christianity of these letters differs considerably from the well-known Pauline type. The distinctively Pauline characteristics are absent or are appreciably modified. The Christianity of the Pastorals can easily be explained as that of the next succeeding age when the general positions of the Christian faith had become fixed and the distinctively Pauline type had become somewhat obscured and matters had settled more nearly to the level we reach in the Christianity of the first half of the second century. For these reasons the most natural date for the Pastorals seems to be somewhere between the period of Paul's own activity and the age of the so-called Apostolic Fathers, or about 90 A.D.

The most serious objections to the argument sketched above are (*a*) the large number of personal allusions, the use of personal names, etc., which seem to make so strongly for genuineness (especially in the case of 2 Timothy), and (*b*) the difficulty of accounting for the acceptance and circulation of spurious Pauline Epistles in a period so soon after the time of Paul himself (it is generally acknowledged that the Pastorals cannot be dated much later than 100 A.D.). In regard to (*a*), some have thought that use was made (especially in 2 Timothy) of fragments of Pauline correspondence, but this hypothesis is difficult to work out successfully. In regard to (*b*), it must be remembered that literary habits and standards were somewhat different in ancient times from those we are familiar with. Spurious writings could circulate more easily and the practice of pseudonymity was not viewed as reprehensible, if done to promote the cause of truth or sound doctrine.

The general purpose of the Pastorals may be said to have been to furnish the Church with a convenient set of instructions regarding the administration of church affairs and the necessity of combating the insidious and corrupting forms of error that threatened to work the moral undoing of the Church.

Hence though apparently private letters, in the words of the Muratorian Canon (c.175 A.D.), —*in honore tamen ecclesiæ catholicæ in ordinationem ecclesiasticæ disciplinæ sanctificatæ sunt*, which may be rendered—"nevertheless they have been sanctified in honor of the Church universal and in the regulation of ecclesiastical discipline."

Bibliography. The article by W. Lock in James Hastings, *Dictionary of the Bible* (new ed. in 1 vol., New York, 1909), and the one by James Moffatt in the *Encyclopædia Biblica* (4 vols., ib., 1899–1903) are comprehensive and present respectively the traditional and the more liberal views. Consult also: Theodor Zahn, *Introduction to the New Testament* (Edinburgh, 1909); James Moffatt, *Introduction to the Literature of the New Testament* (New York, 1911); and the commentaries of R. F. Horton in *The Century Bible* (ib., 1901); N. J. D. White in *The Expositor's Greek Testament* (ib., 1910); M. Dibelius in Leitzmann, *Handbuch zum neuen Testament* (Tübingen, 1913).

TIMOTHY GRASS (so called from Timothy Hanson, who, it is said, introduced its cultivation into the Carolinas about 1720), *Phleum pratense*, the most valuable species of the genus for hay and pasturage. It is the herd's grass of New England and New York, and along with the other species of the genus, is in England often called cat's-tail grass. It has a long cylindrical panicle so compact as to resemble a close spike, strong culms, becoming 4 to 5 feet high, but tender and nutritious, and much relished by cattle. It is perennial, but springs up rapidly, even in the year in which it is sown. The seed is very small. The plant varies in size according to soil and situation. In the United States timothy hay is considered one of the most valuable hays made wholly from grass and is commonly used as the standard with which to compare other hays. (For its feeding value, see Grasses; Hay.) It may be sown alone, or (more commonly) mixed with clover, generally with red clover. It succeeds best on moist, rich soils. Upon dry soils it is often bulbous at base, and this form, which is due to the conditions of growth, was once described as a distinct species (*Phleum nodosum*). A smaller species, *Phleum alpinum*, is a common grass in alpine regions throughout the Northern Hemisphere. See Plate of Grasses.

TIM′PERLEY, Charles H. (1794–c.1846). An English printer and author, born in Manchester, and educated at the free grammar school there. He served in the Napoleonic wars and was wounded at Waterloo. Returning to England, he worked under an engraver and copperplate printer, and in 1821 he became a letterpress printer. Late in life he settled in London, where he died. His valuable publications connected with printing comprise *The Printer's Manual* (1838); *A Dictionary of Printers and Printing* (1839); and *Songs of the Press*, original and selected, the best collection of printers' songs in English (1833). The first two books were issued in 1842 as an *Encyclopædia of Literary and Typographical Anecdotes*. Timperley also published *Annals of Manchester* (1839).

TIM′ROD, Henry (1829–67). An American poet, born in Charleston, S. C. He was educated at the University of Georgia and studied law with the well-known jurist James Louis Petigru, but finally became a private tutor in families, which gave him more leisure for verse writing. During the years before the Civil War he formed one of the coterie presided over by William Gilmore Simms (q.v.), and contributed poems to *Russell's Magazine* and the *Southern Literary Messenger*. In 1860 he published a volume of poems which was favorably noticed. He was war correspondent of the Charleston *Mercury* and in 1864 removed to Columbia, S. C. His later years were passed in poverty and physical pain. His friend Paul H. Hayne superintended an edition of his poems (1873), which was well received by competent judges. In 1899 a memorial edition of his works was undertaken. His fame as the best of southern lyrists, after Poe, and probably Sidney Lanier, is now well established. One of his best poems is an admirable ode on the Confederate dead buried in Magnolia Cemetery, Charleston. Consult J. A. B. Scherer, *Holy Grail: Six Addresses* (Philadelphia, 1905).

TIMSAH, tĭm′sä, Lake. A lake traversed by the Suez Canal (q.v.).

TIMUCUA, tē-mōō′kwȧ, or Timuquanan (ruler, master). A group of tribes, constituting a distinct linguistic stock, formerly occupying central and northern Florida from about Tampa Bay and Cape Canaveral northward to St. Mary's River. When first known to the Spaniards they had about 40 settlements, principally along the lower St. John's River. Narváez (1527) and De Soto (1539) both passed through their territory, each meeting determined resistance. The Huguenots, under Laudonnière, landing on the east coast in 1564, were received with friendship, continued during the brief existence of the French colony. At this time there seem to have been at least five cognate tribes, with differing dialects. On the expulsion of the French the Timucua came under the dominion of the Spaniards, by whom they were compelled to work upon the fortifications of St. Augustine. In 1687, greatly diminished, they made an unsuccessful attempt to revolt. In 1702–06 inroads of the English of Carolina, with their hundreds of Indian allies, wiped out the mission villages of the Timucua, who fled to the upper waters of the St. John's, where Tomoco River in the present Volusia County preserves their name. The Seminole (q.v.) took their abandoned territory. Consult Pareja, *Arte de la lengua timuquana* (new ed. by Adam and Vinson, Paris, 1886).

TIMUR, tē-mōōr′, Timur-beg, Tamerlane, or Timur-leng (Timur the Lame) (1336–1405). A Mongol conqueror, born at Kesh or Sebz, about 40 miles south of Samarkand. His father Teragai was head of the clan of Berlas. Among the Mongol chiefs who were then in control of Turkestan was Haji Berlas, uncle of Timur, who had established himself at Kesh, and here the future conqueror passed his youth under the careful guidance of his studious father. In 1360 the Kalmucks of Jettah, led by Tughlak Timur, subjugated Turkestan. Declining to accompany his uncle in flight, Timur met Tughlak, who made him governor of Kesh. The Kalmucks were ultimately expelled in 1365, and Turkestan was divided between its two liberators, Hussain and Timur. In 1369 war broke out between them, Hussain was defeated and slain, and Timur became lord of Turkestan. He then proceeded to take vengeance on the Kalmucks and turned westward to punish the predatory tribes of Khwarizm, who had plundered Bokhara. He spent the interval between these campaigns in supporting Toktemesh Khan, one of the claimants to the throne of Kiptchak, whom he placed in 1376 in undisputed possession. In 1383 the people of Herat, whom he had subdued a short time before, rebelled and murdered his envoys. In punishment for this 2000 of the garrison, built up with alternate layers of brick and mortar into the form of a pyramid, were left by Timur as a reminder of the consequences of rebellion. In the following year he invaded Mazanderan, and by the close of 1387 the whole of the country east of the Tigris, from Tiflis to Shiraz, was subdued.

Meanwhile, Toktemesh Khan invaded Timur's territories on the Amu. Timur brought him to bay on the banks of the Bielaya (a tributary of the Kama), June 18, 1391, where he almost annihilated his forces. In 1392 Timur subdued the warlike principalities to the east of the Euphrates, then advanced northward, through the gates of Derbend, to the Volga; and after again routing Toktemesh at the Terek in 1395, he extended his conquests as far as Moscow, returning by Astrakhan and the Caucasus. In 1398 Timur entered India by the passes of the Hindu Kush, near Kabul, and routed the opposing armies till the number of prisoners became so great that four days before the great battle at Delhi he ordered the murder of all the males (said to be 100,000 in number), and then took the capital. After advancing to the Ganges, Timur returned to Samarkand, where he expended the spoils of the expedition in the adornment of his city. In the following year he attacked the Egyptian Empire in Syria, and was as usual successful. Timur's aid was then invoked by the Emperor of the East and other princes to help them defeat the Turks led by Bajazet I (q.v.). The two hosts met at Angora on July 20, 1402, and Bajazet was defeated and captured. The conquest of the whole of Asia Minor speedily followed. The Byzantine Emperor as well as the Turkish ruler of Thrace did homage to the victor. On his return Timur conquered Georgia, where he passed the winter, and, resuming his march in the following year, he reached Samarkand in 1404. Here he resumed preparations for his long projected invasion of China, and was marching along the Sihun when he was attacked by ague, and died after a week's illness, Feb. 17, 1405.

Timur did much to promote the arts and sciences throughout his dominions, and, despite his cruelty in war, was an able and kindly ruler in time of peace, although the speedy dissolution of his Empire deprived his labors of any permanent utility. Two works are attributed to him, entitled *Malfūzāt*, or Annals, translated by Stewart (London, 1830), and *Tukūzāt*, or Ordinances, translated by Davy-White (Oxford, 1783) and Langlés (Paris, 1878). Their authenticity is neither proved nor disproved. In literature Timur is best known through Marlowe's (q.v.) drama *Tamburlaine the Great*. Consult: Sharaf ud din Ali Yazdi, *Zafarnâmah*, translated by Petis de la Croix, *Histoire de Timur-Bec, connu sur le nom du grand Tamerlan* (4 vols., Paris, 1722); Manger, *Vita Timuri*, a translation of the Arabic biography by Ibn Arabshah (Leeuwarden, 1767–72); Stanley Lane-Poole, *Mediæval India* (London, 1903); Horn, "Geschichte Irans in islamitischer Zeit," in Geiger and Kuhn, *Grundriss der iranischen Philologie*, vol. ii (Strassburg, 1904); "Cour-Emir," in *Les mosquées de Samarcande*, part i, published by the Commission Impériale Archéologique (St. Petersburg, 1905).

TIN (AS. *tin*, OHG. *zin*, Ger. *Zinn*, tin; connected with Goth. *tains*, AS. *tān*, OHG. *zein*, twig, thin leaf of metal). One of the elements, a metal known since times of great antiquity. Relics of Assyrian civilization include implements made of alloyed copper and tin, a form of what is now known as bronze. The tin used in making the alloy was obtained by the Phœnicians from the Cassiterides, islands probably situated somewhere off the west coast of Europe. The location of this source of supply has given its name to the principal ore of tin—cassiterite. It is known that after the Roman conquest of Britain, tin was carried from the Cornish mines through Gaul by way of Marseilles to Italy. Pliny distinguished tin as *plumbum album* or *candidum* from *plumbum nigrum* (lead), and about the fourth century the name "stannum" was given to tin. Because of its qualities, among which is the property of forming brittle alloys, the alchemists called it *diabolus metallorum;* by others it was called jupiter. It is sometimes found native in irregular, rounded, crystalline grains, or aggregations of grains. It occurs with platinum, iridosmine, gold, copper, cassiterite, and corundum in washings from the Aberfoil and San rivers (headwaters of the Clarence River) near Obau, New South Wales. Other occurrences of native tin have been reported, but all of them are doubtful. The principal tin ore is cassiterite, tin oxide (SnO_2), in which tin forms 78.6 per cent and oxygen 21.4 per cent. Sometimes a little Ta_2O_5 enters into association with it. Cassiterite is often referred to as tinstone. It occurs in crystals and massive, and has specific gravity varying from 6.7 to 7.02, the ordinary variety being about 6.96. Tin is also found as the sulphide, with copper and zinc, the mineral being known as stannite, or tin pyrites. Small quantities of tin are found in other minerals, but not in such quantities as to be of commercial value as tin ores.

Tin (symbol, Sn, stannum; atomic weight, 118.7) is a silver-white, lustrous metal that has a specific gravity of about 7.3, and melts at 235° C. (455° F.). It can be easily rolled or hammered out to thin foil and at 100° C. (212° F.) it may be drawn into wire, which has but little tenacity. At moderately low temperatures (—48° C.) it transforms itself into a modification known as gray tin, which is brittle and useless. This form is sometimes called the tin disease. White tin, which has a fibrous, crystalline structure, is used in the manufacture of tin plate, which is so largely used in the making of cans for preserving foods, and the articles usually referred to as tinware. It is also used for making tinfoil, for making noncorrosible pipe, and for alloys, including amalgam for silvering mirrors, bell metal, Britannia metal, bronze, gun metal, pewter, type metal, etc. A large amount of tin is used for making roofing plates, but the tin is usually, in such uses, alloyed with lead, the resulting plates being known technically as terne sheets. Tin does not oxidize in the air at ordinary temperatures, but is easily oxidized on heating in the air or in oxygen. It forms two oxides. Stannous oxide, or monoxide, is an olive-brown powder obtained when stannous oxalate is heated out of contact with air. It combines with basic radicals to form stannates, of which the sodium stannate is used in calico dyeing and printing. The stannic oxide, or dioxide, which is found native as cassiterite, is obtained as a white powder when tin is heated until it burns in air. In the form of putty powder it is used for polishing plate glass, and for giving a white color to glass and enamels. Stannous chloride, $SnCl_2$, and stannic chloride, $SnCl_4$, are both used as mordants in dyeing and calico printing under the name of tin salts or tin crystals, and are readily prepared by dissolving the metal in hydrochloric acid. Stannic sulphide, which is prepared by heating tin with mercury, sulphur, and ammonium chloride, is known commercially as mosaic gold, and was formerly used for gilding, imitating bronze, etc. The purple colored precipitate obtained by the reaction of gold chloride on stannous salts has been described under CASSIUS, PURPLE OF. Hot, strong hydrochloric acid dissolves tin readily, forming stannous chloride and evolving hydrogen. Warm, dilute sulphuric acid gives stannous or stannic sulphate, according as the tin or acid is in excess, and hydrogen is evolved; but with hot, concentrated acid sulphur dioxide, sulphureted hydrogen and sulphur are obtained in place of hydrogen. The strongest nitric acid has no action; when sufficiently diluted it forms metastannic acid, $H_{10}Sn_5O_{15}$, probably owing to the hydrolysis of previously formed stannic nitrate. The dilute acid forms stannous and ammonium nitrates. Aqua regia forms stannic chloride. Hot, strong, caustic soda or potash forms sodium or potassium stannate with evolution of hydrogen.

Occurrence and Production. Tin ore, or cassiterite, has been found in many parts of the world, but from a commercial standpoint its deposits are limited. Its sources are veins in the older rocks, particularly a variety of granite called greisen, and alluvial deposits, the latter having been formed by the erosion of rocks carrying the veins. The ores obtained from veins are known as lode tin, while those found in stream deposits are known variously, according to locality, as black tin, tin sand, stream tin, and barilla. The principal supplies of ore are obtained from the East Indies, in the islands of Banca, Billiton, and Sumatra, the Malay Peninsula, Australia, Bolivia, and Cornwall, England. Most of the ore from the East Indies and the Malay Peninsula is obtained by washing alluvial gravels. There are also mines in Saxony, Bohemia, Russia, Spain, Portugal, and Japan, but the total output of these countries is insignificant. The presence of tin deposits in California, Texas, South Dakota, and North Carolina has been known for a long time, but up to this time there has been no mining on a commercial scale. A discovery of tin ore in the York District of Alaska has induced exploration in that region, and Bolivia is an important source of tin production. The exports from Bolivia in 1915 were estimated to be about 42,000 tons of tin concentrates, all of which was smelted abroad, since there were no facilities for tin smelting in Bolivia. In the United States the most promising district is along the border of North and South Carolina, extending from Cherokee County, in the latter State, over into Lincoln Co., N. C. These deposits have been worked in a desultory way only, but they may become commercially important if they can be exploited as a unit and in a modern, systematic way. Some ore is produced from the Alaska deposits, but the amount is insignificant as compared with the domestic tin requirements. A smelter for tin ores and an electrolytic plant for the refining of the tin bullion was built at Perth Amboy, N. J., in 1915. This plant was expected to bring South American ores to the United States for smelting, practically all the smelting having been done in Europe heretofore. The accompanying table from the *Engineering and Mining Journal* shows the tin production and consumption for 1915.

In addition to the localities already mentioned, tin is mined in the Belgian Congo, and also at Briseis, Tasmania; at Yunnan, China; Siamese Malaya; and in South Africa.

Metallurgy. The only ore of tin extensively used for the extraction of the metal is tinstone, or cassiterite. The preliminary processes are essentially concentration, and the result is a high-grade product containing 60 per cent or more of tin. See ORE DRESSING.

The tin ore thus provided has next to be deprived of its sulphur and arsenic, if these substances are present. This is usually done in a reverberatory furnace, although one of the forms of roasting machines may be used. The flues of the roasting device, whatever its type, are connected with condensing chambers in which the arsenic is deposited in crystalline form. The sulphur, present in the form of iron sulphide, is decomposed by the heat into sulphurous-acid gas, and the remaining oxide of iron is removed by subsequent washing. Copper sulphide, when present, is converted into copper sulphate by roasting and oxidation, when it is easily removed by leaching.

TIN PRODUCTION AND CONSUMPTION

IN LONG TONS

LOCALITY	1913	1914	1915
Exports, Straits and Malay Pen.	62,242	61,986	66,760
Exports, Australian	3,253	1,771	2,275
Banca and Billiton sales	17,142	10,975	15,093
Chinese exports and production	8,200	8,255	7,097
Bolivian exports	22,719	24,844	18,800
South African production	1,900	2,276	2,158
Nigerian production	.....	1,962	1,899
Cornwall production	4,900	4,500	4,000
Total	120,356	116,569	118,082
U. S. imports and consumption	45,900	42,995	49,480
Great Britain, imports and cons.	28,736	30,531	39,937
Holland, imports	16,573	15,810	7,625
Other Europe, imports	21,250	18,633	11,550
Australian consumption	1,000	1,050	1,100
China and India consumption	6,500	6,400	6,650
Totals	119,959	115,419	116,342
Visible stocks, Dec. 1	16,045	13,432	14,535

After this final washing the ore is ready for smelting, which is usually performed in a reverberatory furnace. The charge consists of from 20 to 25 cwt. of ore mixed with about ⅛ its weight of powdered anthracite or charcoal, and a small quantity of lime or fluorspar to serve as a flux for the siliceous matter. Before being put into the furnace the mixture is moistened with water to prevent the finely powdered ore from being carried away by the draft. When the charge is placed on the hearth of the furnace, the doors are closed and the heat gradually raised for about six hours. The oxide is then reduced by the carbon. Then the furnace door is opened and the mass worked with a paddle to separate the slag, which is raked off, and the richer portion of it smelted over again. The reduced tin sinks to the bottom, and is run off into a cast-iron pan, from which it is ladled or run into molds to produce ingots of convenient size.

The tin has still to be purified, or refined, and a process of liquation is followed. This consists of moderately heating the tin ingots in a reverberatory furnace until the tin, owing to its low melting point, melts and flows into the refining basin, leaving on the hearth a residuary alloy of tin and other metals. When the refining basin contains its full charge, it is ready for boiling. In this operation billets of green wood are plunged into the melted metal, the disengagement of gas from which gives rise to a constant boiling, and causes a scum, chiefly tin oxide, to rise to the surface. It is then removed, while at the same time the impure and dense particles fall to the bottom. When the agitation has continued long enough the bath is allowed to settle and cool. The tin then separates into zones—the upper consisting of the purest part, the middle being more mixed with other metals, and the lower so impure that it has to go through the refining process again.

The residuary alloy of the liquation process also has its tin extracted and is again refined. While the process described is one that is followed to a great extent, and is the standard one of former practice, modern improvements are making changes that are coming more and more into use. Recent experiments have shown that the electric furnace is probably more adaptable to tin smelting than to most of the other metals. Electrolytic refining is also successful, and has already been incorporated into operating plants.

In former times in Cornwall tin was smelted in a blast furnace, but through the use of this process there is a great deal of waste because of the applications of high temperatures and, besides, the conditions of the blast furnace are such that a great deal of iron is also reduced, a condition that is prejudicial to good smelting practice.

Tin ores that contain the mineral wolframite (tungstate of iron and manganese) are treated by a process patented by Oxland, and known by his name. This mineral cannot be separated successfully because its specific gravity is so nearly that of tin ore. In Oxland's process the tin ore is roasted with sodium sulphate, the insoluble iron tungstate converted into soluble sodium tungstate, which is then leached out. Oxides of iron and manganese are left finely divided, and because of their lower specific gravity they can be washed away from the tin compounds. The tungstate of soda thus obtained has been used for fireproofing cotton cloth.

Tin Plate. A great part of the tin produced is used for making tin plate, which is iron or steel in sheet form, covered on both sides with tin. The sheets are cleaned with acid, after which they are plunged into baths of molten tallow and tin. The tallow prevents oxidation of the tin during the process, which must be carried out at a temperature at which tin would oxidize if allowed to come into contact with the air. After the sheets have taken on a plating of the required thickness they are cleaned with bran.

Bibliography. A. G. Charleton, *Tin, Chief Methods of Mining, Dressing and Smelting* (London, 1884); S. Fawns, *Tin Deposits of the World* (ib., 1905); F. L. and E. Hess, *Bibliography of the Geology and Mineralogy of Tin* (Washington, 1912); *The Mineral Industry* (New York, annual). For the metallurgy of tin: Carl Schnabel, *Handbook of Metallurgy* (Eng. trans. by Henry Louis; 2d ed., 2 vols., London, 1905–07); Henry Louis, *Metallurgy of Tin* (ib., 1911).

TINAMOU, tĭn′ȧ-mo͞o. The native, and now the popular, name for birds of the family Tinamidæ, inhabiting the tropical portions of South America, having many remarkable features in their internal organization, and the striking external character that the tail is exceedingly short or entirely absent. Like partridges in general appearance, and varying in size from that of a quail to the bigness of a large grouse, and prevailingly brown in color, they are classed as game birds in South America, and are frequently called partridges. Their flight is strong and swift, but of short duration and very direct, yet they haunt the undergrowth of dense forests or bushy and grassy flats, run with amazing rapidity, and conceal themselves with great skill, rather than take to flight. Their food is miscellaneous, like that of game birds generally, and their voice a mellow whistle. The flesh is delicious. They make very simple nests on the ground, and lay eggs varying from reddish chocolate, wine purple or liver color, to dark blue or green, and burnished to a metallic sheen. See Plate of Cassowaries, etc.

The tinamous have been regarded by many systematists as within the Ratitæ, but more recently are considered as a separate group of ordinal rank at the foot of the Carinatæ, just preceding the Galliformes. Consult: Hans Gadow, "Aves," in *Bronn's Klassen und Ordnungen des Thier-Reichs* (Leipzig, 1893); Alfred Newton, *Dictionary of Birds* (New York, 1896); Sclater and Hudson, *Argentine Ornithology* (London, 1889); A. H. Evans, "Birds," in *Cambridge Natural History*, vol. ix (New York, 1900); F. H. Knowlton, *Birds of the World* (ib., 1909).

TINAVELLY. See Tinnevelli.

TINAYRE, tē′nâr′, Marcelle (*née* Chasteau) (1877–). A French novelist, born at Tulle and married in 1889 to Julien Tinayre, an engraver. Her first novels attracted little attention, but the third, *Hallé*, was crowned by the French Academy in 1896. Later notable fiction comprises: *L'Oiseau d'Orafe* (1901); *La maison du péché* (1902); *La rebelle* (1906); *L'Amour qui pleure* (1908); *L'Ombre de l'amour* (1910; Eng. trans., *The Shadow of Love*, 1911); *La douceur de vivre* (1911); *Madeleine au miroir* (1912; Eng. trans., *Madeleine at her Mirror*, 1913); *Le départ* (1915). Consult Winifred Stephens, *French Novelists of To-day*, (2d series, New York, 1915). Her novels are didactic, the enfranchisement of woman constituting an important theme; they are marked by rare delicacy and a graceful wit and are strikingly objective and intellectual.

TINCTURA GIOBERTINA. See Giobertine Tincture.

TINCTURE (from Lat. *tinctura*, a dyeing, from *tingere*, to dye, Gk. *τέγγειν*, *tengein*, to moisten, dye). A medicinal preparation of a drug by maceration or by dissolving nonvolatile principles in strong or dilute alcohol. In almost all cases the resulting liquid is of a decided color; hence the name. Obviously tinctures must be kept in tightly closed bottles to prevent evaporation. There are over 70 official tinctures in the *United States Pharmacopœia*. Among these are the tincture of aconite, the once popular tincture of arnica, used for bruises and sprains; the bitter tincture; compound tincture of cinchona; tincture of the chloride of iron; tincture of digitalis; tincture of iodine; tincture of ipecac and opium; compound tincture of lavender; tincture of myrrh, largely employed in mouth washes and dentifrices; tincture of opium, or laudanum; camphorated tincture of opium, or paregoric; tincture of rhubarb; tincture of squill; tincture of valerian; and tincture of ginger, frequently known as essence of ginger.

TINCTURE. The general designation for colors, metals, and furs in heraldry (q.v.).

TINCTURE OF OPIUM. See Laudanum.

TIN′DAL, Matthew (c.1653–1733). An English deistical writer. He was the son of a clergyman at Beer-Ferris, in Devonshire, was educated at Oxford, and elected fellow of All Souls College in 1678. After a brief lapse into Romanism during the reign of James II he reverted to Protestantism, or rather, as events showed, into rationalism. It was not till 1706 that he attracted particular notice, when the publication of his treatise on *The*

Rights of the Christian Church Asserted Against the Romish and All Other Priests Who Claim an Independent Power Over It raised a storm of opposition in England, but in Protestant circles on the Continent was highly praised. In 1730 he published his most celebrated treatise, entitled *Christianity as Old as the Creation, or The Gospel a Republication of the Religion of Nature.* The design of the work is to strip religion of the miraculous element, and to prove that its morality is its true and only claim to the reverence of mankind. Tindal's book is in excellent English and commanded much attention. Bishop Butler's *Analogy* was largely written as an answer to it. Consult Leslie Stephen, *History of English Thought in the Eighteenth Century* (3d ed., 2 vols., New York, 1902). See Deism.

TINDER. An inflammable material, usually made of half-burned linen. It was formerly one of the chief means of procuring fire before the introduction of friction matches. The tinder was made to catch the sparks caused by striking a piece of steel with a flint; and the ignited tinder enabled the operator to light a match dipped in sulphur. This was necessary, as tinder will not flame. Decaying wood—of willows and similar trees—also affords tinder; certain fungi furnish the German tinder, or amadou (q.v.).

TIN'EA (Lat., gnawing worm). A name given to several varieties of vegetable parasitic skin diseases. For tinea favosa, see Favus. Tinea trichophytina or ringworm may appear as an eruption on several parts of the body, receiving a modification of the name in each case, as corporis, cruris, capitis, barbæ, etc. It is common among the poorer classes, and spreads rapidly in schools and asylums. Tinea of the scalp often comes from indiscriminate use of towels, combs, and brushes. A red spot appears, marking the beginning of the eruption, which soon becomes scaly and enlarges, forming a ring possibly half an inch in diameter, leaving a clear centre. The margin of the circle is well defined, elevated, red, and covered with fine scales easily detachable. Mycelium and spores are seen in microscopical examination. There is seldom much irritation, except in cases where the crural fold or axilla is invaded. The tinea trichophytina cruris or eczema marginatum is not infrequent in the United States. In warm climates it is common and severe, and is known as Indian, Chinese, or Burmese ringworm, also as Dhobie's itch. Hyposulphite of soda, bichloride of mercury, acetate of copper, and tincture of iodine are frequently efficacious in the tinea corporis and cruris. Bulkley recommended sulphurous acid for the latter. Tinea capitis, also called tinea tonsurans, is very intractable, and the application of carbolic acid, green soap, mercury, oil of cade, etc., must be kept up, always in the form of an ointment. The X-ray is now extensively and successfully used to kill the mycelium. Tinea versicolor, or Pityriasis versicolor, is very common in warm countries, though also frequent in the United States. The front of the chest is most often attacked, the back next. The parasite Microsporon furfur is probably the cause of tinea versicolor. The treatment consists of frequent bathing with soap, hyposulphite of soda applications, or the use of mercurial preparations, salicylic acid, sulphur, and glycerin.

TINEIDÆ, tĭ-nē'ĭ-dē. See Leaf Miner.

TINEL, tā'nĕl', Edgar (1854–1912). A Belgian pianist and composer, born at Sinay. In 1863 he studied at the Brussels Conservatory, and (1873) received first prize for pianoforte and published four nocturnes for solo voice with piano. In 1877 his cantata *Klokke Roeland* won the Grand Prix. He succeeded Lemmens as director of the Institute for Sacred Music at Mechlin, in 1882, and in 1888 produced the oratorio *Franciscus*, which gave him fame. In 1889 he became inspector of the state music schools of Belgium, and in 1896 professor of counterpoint and fugue at Brussels Conservatory. He produced a *Grand Mass of the Holy Virgin of Lourdes* for five parts; *Te Deum* for four-part mixed choir with organ; *Alleluia* for four equal voices with the organ; the music drama *Godoleva* (1897); the sacred opera *Katharina* (1909); motets and sacred songs. He also published *Le chant grégorien, théorie sommaire de son exécution* (1895). Consult Van der Elst, *Edgar Tinel* (Ghent, 1901).

TINGHAI, tĭng'hī'. Chief town of the island of Chusan (q.v.), Chekiang Province, China.

TINGITIDÆ, tĭn-jĭt'ĭ-dē. See Lace Bug.

TINGLEY, tĭng'lĭ, Katherine (*née* Westcott) (1852–). An American theosophist, born at Newburyport, Mass. In 1889 she was married to P. B. Tingley. After 1898, as leader and official head of the Universal Brotherhood, a theosophical organization which she had founded, she gained recognition as the successor of W. Q. Judge and Madame Blavatsky (qq.v.). She conducted theosophical crusades around the world in 1896–97 and 1904. The headquarters of the society were removed from New York to Point Loma, Cal., where Mrs. Tingley founded a colony that became noted. Here she established her School of Antiquity, a Raja Yoga Academy, and also an orphanage. During the Spanish-American War she was active in relief work. She became editor of a theosophical journal, the *Century Path*, and published: *The Mysteries of the Heart Doctrine* (1902); *A Nosegay of Everlastings* (1914); *Theosophy and Some of the Vital Problems of the Day* (1915). See Theosophical Society.

TINGUAITE, tĭŋ'gwȧ-īt (named from Sierra de Tingua, Brazil). An igneous rock of granular or porphyritic texture, characterized by the mineral combination alkali feldspar, nepheline, and ægerine, or ægerine augite. It is a rock of very limited distribution, but generally occurs in dikes associated with nepheline syenite, to which it is genetically and chemically related.

TINGUIAN, tĭŋ'gĭ-än', or Itneg, ĭt-nĕg'. A pagan mountain people of northwestern Luzon. Their stronghold is in the subprovince of Abra, but their settlements extend into the Ilocos provinces. They have domestic animals, extensive rice fields, and compact villages. Until recently the custom of head-hunting made loose federations among groups of villages necessary, and thus a number of dialect groups have sprung up.

The government is an oligarchy, the old men of each village constituting its ruling class. A peculiar but highly developed form of spiritualism, combined with an elaborate ceremonial, is found among them. An unorganized priesthood forms the medium through which the superior beings make known their wishes. Along the northern and western borders the people are skilled ironworkers, and their spears and head axes have a wide distribution throughout northwestern Luzon. Consult F. C. Cole, "The Tinguian," in *Philippine Journal of Science* (Manila, 1909). See Philippine Islands.

TINKER BIRD, or Tinker Barbet. See Coppersmith.

TINKER'S ROOT. See Feverwort.

TINNÉ, tē'nā' (Athapascan, people). A collective term sometimes used as synonymous with Athapascan stock (q.v.), but more usually employed to designate the tribes of that stock residing in the Canadian northwest. See Athapascan Stock.

TINNÉ, tĭn'nā, Alexandrine (or Alexine) (1839–69). A Dutch explorer in Africa, born at The Hague. In 1856 she visited Palestine, Syria, and Egypt. She started for the Upper Nile in January, 1862, and reached Gondokoro in September, but was compelled by sickness to return to Khartum. In February, 1863, she set out with an enormous train on a second expedition, with Bahr-el-Ghazal for its goal, in which Heuglin and Steudner participated and which advanced as far as Dembo in the Bongo country. Steudner and Miss Tinné's mother having succumbed to the climate, the expedition returned to Khartum in March, 1864. Its results were described in the *Transactions of the Historical Society of Lancashire, etc.*, vol. xvi (Liverpool, 1864). In 1865 Alexine Tinné visited Crete, Greece, and Italy, went to Algiers in 1866, traveled through the French Sahara in 1868, and in January, 1869, started with a strong retinue for the interior, intending to penetrate to the Nile via Bornu. Detained by sickness at Murzuk, she then proceeded towards Ghat by invitation of the Tuareg chief Ikhenukhen, but was assassinated by the Tuaregs escorting her, on August 1. Consult Heuglin, *Die Tinnésche Expedition im westlichen Nilgebiet, 1863–64* (Gotha, 1865), and id., *Reise in das Gebiet des Weissen Nil, etc.* (Leipzig, 1869).

TINNEVELLI, tĭn'ē-vĕl'ĭ, or **TINAVELLY.** The capital of a district of Madras, British India, 99 miles southwest of Madura, on the left bank of the Tambraparni River (Map: India, C 8). It is connected with Palamcotta on the opposite bank by a handsome bridge. The most striking edifice is the Siva temple. There are two colleges, and the town has long been an important centre for Protestant missions. Cotton goods are extensively manufactured. Tinnevelli became a British possession in 1801. Pop., 1901, 40,469; 1911, 43,741.

TINNI'TUS AU'RIUM (Lat., ringing of the ears). Ringing in the ears. In most cases it is an unimportant symptom, depending on some local temporary affection of the ear, or on some disturbance of the digestive system; but as it is also a common symptom of organic disease of the auditory nerve, it may indicate a dangerous condition, or may be a prelude to complete deafness. It may be a symptom of neurasthenia (q.v.), and may occur in a number of diseases. Hence it is a symptom that, especially if permanent, must be carefully watched. It may be induced for a few hours by a large dose of quinine or of the salicylates.

TINOC'ERAS. A huge proboscidean, allied to *Coryphodon*, *Dinoceras*, and *Uintatherium*, found fossil in the Middle Eocene (Bridges) formations of Wyoming. Its most prominent characteristic was the long, narrow, somewhat quadrangular skull, bearing six great protuberances, one pair on the nasal bones pointing forward, a second outward-bending pair on the upper jawbones (maxillaries), and a third over the eyes (on the parietals), where there was a semicircular upright crest of bone. These protuberances seem not to have been covered with ordinary horn. The typical species is Tinoceras ingens, described by O. C. Marsh, *Dinocerata: A Monograph of an Extinct Order of Gigantic Mammals* (Washington, 1884).

TINOS, tē'nōs. One of the Cyclades. See Tenos.

TIN PYRITES. See Stannite.

TINSEAU, tăɴ'sō', Léon, Count de (1842–). A French novelist, born at Autun. He wrote many popular and ably written novels which show especial skill in development of plot. Among them are: *Robert d'Epirien* (1882); *La meilleure part* (1884), crowned by the French Academy; *Bouche close* (1889); *Plus fort que la haine* (1891); *Mensonge blanc* (1900); *La princesse errante* (1903); *Les étourderies de la chanoinesse* (1906); *La deuxième page* (1914).

TINSTONE. See Cassiterite.

TINT'ERN ABBEY. A beautiful monastic ruin in England, in a meadow on the west bank of the River Wye, 9 miles below Monmouth. Theodoric, British King of Glamorgan, was said to have fallen in battle against the heathen Saxons here, 600 A.D. The abbey was founded in 1131 for Cistercian monks by Walter de Clare; the church was begun a century later through the munificence of Roger de Bigod, Earl Marshal, and dedicated in 1268. The tower and roof are gone; but the church remains a fine example of the Decorated style—the English High Gothic—beautiful in composition and delicate in execution. The nave is 228 feet long, the transept 150, and the width of nave and choir 37 feet. The ruins of the convent buildings also remain. Tintern Abbey is well known through Wordsworth's poem.

TIN'TORET'TO, Il (1518–94). The name usually applied to Jacopo Robusti, one of the chief masters of the High Renaissance in Venice. He was born at Venice, the son of a dyer (*tintore*), whence his name, and at an early age was placed with Titian. According to the traditional account, Titian's jealousy soon forced him to leave; but their separation was probably due to Tintoretto's point of view, which saw in the plastic rendition of the human body in action, rather than in color, the chief problem of art. Taking an independent atelier, he subjected himself to a severe course of training. Following his great aim, as announced in the motto upon the wall of his studio, to unite Michelangelo's design with Titian's color, he drew constantly from casts of the former's sculptures. He dissected bodies to learn anatomy, studied foreshortening and movement from suspended figures, worked by day and lamplight for chiaroscuro, and even learned from house painters the secrets of their craft. Besides the color of Titian he studied the work of his friend Schiavone, from whom he acquired the technique of fresco, and also with Bonifazio Veronese, Berenson believes.

After such preparation his eagerness for activity led him to solicit work at low prices. His earliest paintings, which are rare, show also the influence of Giorgione in color and landscape. The first to attract attention was a lost portrait of his brother and himself with night effect, but the most important surviving example is a "Circumcision" in Santa Maria del Carmine. Later he painted five subjects from Genesis for Santa Trinità, two of which, the "Fall" and the "Murder of Abel," are preserved in the Venetian Academy, the former especially being idyllic in sentiment, and almost equal to Titian in color. After a number of façades, none of which survive, his next work of importance was the decorations of the choir of the Madonna del Orto, 50 feet in height, with a "Last Judgment" and other subjects. To the same period belong the startlingly original "Crucifixion" in San Cassiano, Venice. Finally, Tintoretto's reputation was definitely established by the series of pictures in the Scuola di San Marco describing abduction of the body of the patron saint of Venice from Alexandria to Venice. The episodes represented the "Finding of the Body" (Brera, Milan), its "Abduction from Alexandria," "St. Mark Saving a Saracen from Shipwreck" (both in the Royal Palace, Venice), and "Miracle of St. Mark" (Academy, Venice). All show Tintoretto at his best, especially the last, which so good a critic as Taine esteemed the greatest painting in Italy. It is remarkable for intense dramatic action and for the treatment of the light which issues from the saint's head and shoulders, lending rich color to the well modeled groups.

Tintoretto seldom dated his works, and there is no record of his activity between 1550 and 1560. It is probable that during this period he painted a large number of his easel pieces, and perhaps the three grand compositions in the Ducal Palace, which were burnt in 1577. In 1560 began his remarkable activity for the guild of San Rocco, whose scuola (guild house) forms a perfect museum of his works, of which it and the adjoining church contain 56 in all, painted at different periods of his life. In 1565 he finished the "Crucifixion," a splendid piece of naturalism, and one of his very best works; in 1577 the two panels of the ceiling of the great hall: the "Paschal Feast" and "Moses Striking the Rock." Meanwhile he had become a member of the guild, and in 1577 he was employed at a salary of 100 ducats to furnish three pictures a year—fulfilling this until his death. Among the best are a series from the life of Christ. including a strikingly original "Visitation," "Annunciation," "Christ Before Pilate," "Christ Bearing His Cross," "Ecce Homo," and a "Resurrection."

In the decorations of the Ducal Palace, begun about the same time (1560), he was extensively aided by pupils, especially by his son Domenico. In the Sala del Scrutinio he painted the "Capture of Zara"; in the Antecollegio, four charming mythological representations: "Bacchus, Ariadne, and Venus," "Mercury and the Graces," "Minerva Expelling Mars," and the "Forge of Vulcan"; in the Sala del Collegio, four votive pictures of doges, the finest of which represents the "Marriage of St. Catharine"; and in the Hall of the Senate, "Venice, Queen of the Seas." In the Hall of the Grand Council the Doge and Senate offer the spoils of the conquered cities to "Venice in Glory," and the four battle pieces of the ceiling show keenest effects of foreshortening. There, too, a whole wall is occupied by his last great work, the "Paradise," 74 by 30 feet, the largest oil painting in the world, but which has suffered much from the ravages of time and restoration.

His altarpieces and easel pictures are legion, and may be found in the churches of Venice and principal galleries of Europe. We can mention only the three fine examples in San Giorgio Maggiore; "Susanna's Bath," in Vienna, Paris, and Madrid; "Vulcan, Cupid, and Venus" (Pitti, Florence); "Abraham's Sacrifice" (Uffizi); "Origin of the Milky Way" and "St. George and the Dragon" (National Gallery, London); "Luna and the Hours" (Berlin); and "Christ Visiting Mary and Martha" (Augsburg), one of his loveliest works. The Metropolitan Museum, New York, possesses "Doge in Prayer before the Redeemer" and the large "Miracle of the Loaves and Fishes." During the same period he also designed for St. Mark's Church a series of mosaics of subjects from the life of Christ.

Tintoretto shared with Titian the reputation of being the greatest portraitist of his day. His early portraits, indeed, are often confounded with Titian's, but he soon developed a highly individual style, characterized by naturalism and simplicity. Eliminating all incident, even gesture, the great painter of movement produced likenesses in the highest sense typical. With incredible rapidity he painted the doges and the nobility who were his sitters. Of these portraits over 100 survive; there are important examples which we knew were lost, but many of which were probably executed by his son, Domenico. Among the best are his own likeness in the Louvre and in the Uffizi; Vincenzo Morosini, Paolo Paruto, Tomaso Contarini, and Niccolò Priuli, in the Ducal Palace; the doges Trevisan and Priuli, Jacopo Soranzo, Andrea Dandolo, and Antonio Capello, in the Academy of Vienna; the Doge Niccolò da Ponte Sebastiano Venier, the hero of Lepanto, a "Young General"; a number of admirable unknown portraits, in the Vienna Gallery; "Two Brothers," a fine psychological study of two boys; and a "Senator," Gardner collection, Boston.

The adverse opinion of some critics upon Tintoretto's works is due to the effect of time upon them. He used a dark ground and applied the colors but lightly, with the result that they have greatly darkened. His rapidity of execution often impelled him to do work which was sketchy, sometimes even negligent; but in his best work he shows himself one of the greatest painters of all times. He was, in a way, the culmination of Renaissance painting, and united in himself more than did any other man all its different tendencies. Tintoretto extended the plastic character to the entire composition, and Titian's color harmony of flat surfaces became with him a light symphony of the whole painting. By his mastery of light and shadow he was enabled to put a world of poetry and sentiment in his pictures, without degenerating into illustration. He had a wonderful fertility of imagination. His most startling innovations, however, were in composition; for the problem is far more difficult in Tintoretto's plastic work than in the relief-like productions of others. Sometimes he separated foreground and background, using the action in the latter to concentrate attention on the principal action in the foreground. In dramatic power he is the worthy compeer of Michelangelo, and like him he indicated emotion by the action of the body.

Excepting a year's stay at Mantua, Tintoretto passed all of his life at Venice. Before 1560 he married Faustina dei Vescovi, who seemed to have her share of worry in taking care of her spouse, who was impracticable in money matters. Of his eight children, **Marietta**, the eldest, a gifted artist and his favorite child, met with an early death in 1590, whence the beautiful tradition of the old painter painting his dead daughter. He did not long survive her, and died at Venice, May 31, 1594. His son and assistant Domenico painted many works in superficial imitation of his father.

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TINTYPE. See Ferrotype.

TIN WEDDING. See Wedding Anniversaries.

TINY TIM. In Dickens's *Christmas Carol*, a cripple, the little son of Bob Cratchit.

TIORBA, tē-ŏr′bȧ, Della. See Ferrari, Benedetto.

TIPPECANOE, tĭp′pē-kȧ-nōō′. A popular nickname of Gen. William Henry Harrison, due to his victory over the Indians at the Tippecanoe River in 1811.

TIPPECANOE, Battle of. An engagement fought on Nov. 7, 1811, near the site of the present village of Battle Ground, on the Tippecanoe River, in Tippecanoe Co., Ind., between an American force of about 800, including 500 Indiana and Kentucky militiamen, under William Henry Harrison, then Governor of Indiana Territory, and an Indian force, estimated by Harrison at about 6000, but probably much smaller, under the actual command of White Loon, Stone Eater, and Winnemac. On Oct. 11, 1811, while Harrison was building a stockade on the site of Terre Haute, one of his sentinels was killed from ambush, and Harrison, considering this the beginning of hostilities, soon afterward marched against the town on the Tippecanoe, where the Prophet, a brother of Tecumseh (q.v.), was supposed to be inciting the Indians to attack the whites because of the alienation of Indian lands. On the night of November 6 he encamped within about a mile of the town, and posted his troops in the form of a triangle, having previously arranged with the Prophet for a conference on the following day. Before dawn on the 7th the Indians attacked the camp with great ferocity and bravery, but after more than two hours of stubborn fighting were driven from the field. On the following day Harrison advanced to the town, found it deserted, and almost completely destroyed it. He then returned to Vincennes. The loss of the whites in the battle in killed and wounded was about 190, of whom 34 were officers; that of the Indians, though undoubtedly large, is not definitely known. The battle rendered virtually impossible the realization of Tecumseh's plans, weakened and almost destroyed the prestige of the Prophet, hastened the general outbreak of hostilities by the Indians against the Americans in the Northwest, and greatly enhanced the reputation of General Harrison, who later, partly on the strength of this success, was placed in command of the American troops in the West. A full account of the Tippecanoe expedition is given in Harrison's report to the Secretary of War, November, 1811.

TIP′PERA′RY. An inland county of the Province of Munster, Ireland, lying north of Waterford (Map: Ireland, D 6). Area, 1659 square miles. The county for the most part is in the basin of the river Suir. Other rivers are the Shannon, the Nore, the Nenagh, and the Brosna; lakes are numerous, but of small size. The surface is generally level. The Galtees Mountains which diversify it are rather groups than portions of any connected range; these mountains rise to 3000 feet. The soil of the plain is fertile; there is a considerable amount of bog in the central and eastern districts. The mineral productions are coal (anthracite), copper, and lead, also zinc and good fire clay; slates of an excellent quality are quarried near Killaloe. Wheat was formerly grown in large quantities, but of late years its cultivation has been superseded by dairy farming and the raising of cattle. Pop., 1901, 160,232; 1911, 151,951.

TIPPERARY. The capital of Tipperary County, Ireland, on the Arra, 111 miles southwest of Dublin (Map: Ireland, C 7). It occupies a central position in a fine country, and carries on an extensive trade in butter and condensed milk. The town, of ancient origin, is well built, and contains Roman Catholic and Protestant churches, national schools, and a school of the Erasmus Smith endowment. In 1890 the foundation of a New Tipperary, now in ruins, was an attempt, under the Irish League's plan of campaign, to boycott the land proprietor of the old town. It proved abortive within a year. Pop., 1901, 6281; 1911, 5974.

TIPPLE, tĭp′p'l, Ezra Squier (1861–). An American Methodist Episcopal clergyman and educator, born at Camden, N. Y. He graduated from Syracuse University in 1884 and from Drew Theological Seminary in 1887, taking his Ph.D. at Syracuse the same year. Afterward he held various pastorates in New York City. In 1905 he was elected professor of practical theology and in 1912 president of Drew Theological Seminary. Besides several series of *Drew Sermons*, he published: *The Heart of Asbury's Journal* (1905); *The Minister of God* (1906); *The Life of Freeborn Garrettson* (1910); *Some Famous Country Parishes* (1911); *Francois Asbury* (1916).

TIPPU SAHIB, tē-pōō′ sä′hĭb (1751–99). Sultan of Mysore, in India. He was a son of Hyder Ali (q.v.). He was actively engaged in the wars of his father, and routed the British at Perimbakum (Sept. 10, 1780), and on the banks of the Kolerun in Tanjore (Feb. 18, 1782). On the death of his father in 1782 he was crowned Sultan. On April 28, 1783, he captured and put to death the garrison of Bednore. The peace between England and France deprived him of his French allies and he made a treaty in 1784 on the basis of the status quo. He then gave his attention to the internal affairs of Mysore, establishing a splendid court at Seringapatam. He sought, in 1787, to bring on a renewal of the war between France and England, and failing, invaded in 1790 the protected state of Travancore. In the ensuing war (1790–92) the British, under Colonel Stuart and Lord Cornwallis, were aided by the Mahârattas and the Nizam, who joined in the struggle against their powerful neighbor both out of fear and religious hatred, Tippu being a fanatical Mohammedan. The Sultan laid waste the Carnatic and advanced almost to the gates of Madras, but was defeated near Seringapatam in March, 1792, and compelled to cede one-half of his dominions. Hostilities began again in March, 1799, and two months afterward Tippu was driven from the open field and attacked in his capital of Seringapatam, which was stormed on May 4, the Sultan himself being slain after an heroic resistance. His dominions and property were confiscated, a portion of Mysore, however, being assigned to the Nizam. Consult L. B. Bowring, *Haidar Alí and Tipú Sultán* (London, 1893).

TIP'TON. A town in South Staffordshire, England, 4½ miles southeast of Wolverhampton, with collieries, blast furnaces, and iron manufactures. Pop., 1901, 30,543; 1911, 31,756.

TIPTON. A city and the county seat of Tipton Co., Ind., 40 miles north by east of Indianapolis, on the Lake Erie and Western Railroad (Map: Indiana, E 4). It is the trade centre of an agricultural and stock-raising district. The manufactures are canned vegetables, catsup, brooms, cutlery, and shoes. It was settled in 1844 and incorporated 10 years later. Pop., 1900, 3764; 1910, 4075.

TIPU'LIDÆ. See CRANE FLY.

TIPWORM. The larva of one of the gall midges (*Cecidomyia oxycoccana*), which occurs in the terminal buds of the cranberry plant and causes them to become unusually prominent and to stop the development of the leaves. After attack the tip usually dies. The adult fly has a red abdomen and a grayish thorax, and is about one-sixteenth of an inch in length. The female has a long, extensible ovipositor by means of which she thrusts her eggs into the heart of the young shoot. See also HOP INSECTS.

TIRABOSCHI, tē'rä-bōs'kē, GIROLAMO (1731–94). An erudite Italian, born at Bergamo, author of a monumental and still useful *Storia della letteratura italiana* (1772–81, in 14 vols.), of which translations have appeared in French and German. Other works: *Vetera Humiliatorum monumenta* (1766), *Biblioteca modenese* (1781–86), and *Memorie storiche modenesi* (1793).

TIRARD, tē'rär', PIERRE EMMANUEL (1827–93). A French statesman, born at Geneva. He went to Paris about 1846, and in 1870 became mayor of the Second Arrondissement. In 1876 he entered the Chamber of Deputies as a radical Republican and he was successively Minister of Agriculture and Commerce (1879–81 and in 1882), Minister of Finance (1882–85), and Premier (1887–88 and 1889–90). Subsequently he resumed the seat in the Senate to which he had been elected in 1883. From December, 1892, to April, 1893, he was Minister of Finance.

TIRASPOL, tē-räs'pol. A town in the Government of Kherson, South Russia, on the left bank of the Dniester, 73 miles by rail northwest of Odessa (Map: Russia, C 5). It manufactures flour, brick, pottery, and ironware, and has a large trade. Pop., 1900, 29,323; 1910, 35,242.

TIREE, tī-rē', or **TYREE.** A Scottish island, one of the Inner Hebrides (q.v.), included in Argyllshire, 20 miles northwest of Iona (Map: Scotland, A 3). It is 13 miles long and over 6 miles in extreme breadth. There are interesting antiquities. The inhabitants support themselves by rearing cattle, fishing, and exporting poultry and eggs. Pop., 1901, 2195; 1911, 2306.

TIREH, tē'rē. A town of the Turkish Vilayet of Smyrna, Asia Minor, 25 miles southeast of the city of Smyrna, with which it has railway connection (Map: Turkey in Asia, B 3). It is the ancient Tyrrha of the Kingdom of Lydia. Tapestry and cotton manufacturing constitute the chief industries. Pop., estimated at from 13,000 to 20,000.

TIRE'SIAS (Lat., from Gk. *Τειρεσίας*, *Teiresias*). In Greek legend, a famous Theban seer. He is called son of Eueres and Chariclo, and was blind from early youth; because he had seen Athena bathing. To recompense him for his loss of sight, the goddess gave him power to understand the voices of birds. Another legend represents Hera as depriving him of his sight because, being made arbiter in a dispute between her and Zeus, he had decided in favor of the latter; Zeus as a compensation gave him unerring power in interpreting omens, and prolonged life. He appears prominently in the Theban cycle of legends. In the *Odyssey* (book xi) it is recorded that Odysseus went to the lower world to consult him.

TIRHAKAH, tēr-hä'kä. A king of ancient Ethiopia. See TAHARKA.

TIRLEMONT, tērl'mōN' (Flem. *Tienen* or *Thienen*). A town in the Province of Brabant, Belgium, 29 miles east by south of Brussels, on the Geete River (Map: Belgium, C 4). Its walls, which had a circumference of about 6 miles, were dismantled early in the nineteenth century. The chief objects of interest are the restored churches of St. Germain and Notre Dame du Lac. The former is a composite of the Romanesque and early Gothic, and was begun in the ninth century. Its most striking feature is the altarpiece by Wappers. The church of Notre Dame du Lac dates partly from the thirteenth and partly from the fifteenth century. There are manufactures of engines, leather, cotton and woolen goods, etc. The town was occupied by the Germans in 1914. See WAR IN EUROPE. Pop., 1900, 17,855; 1910, 17,581.

TIRNAU. See TYRNAU.

TIRNOVA, tēr'nō-vä (Bulgarian *Trnova*). A district town in Bulgaria, 124 miles northeast of Sofia (Map: Balkan Peninsula, E 3). It contains a number of mediæval churches. The chief industries are dyeing and the manufacture of copper ware. Tirnova was the capital of Bulgaria for about two centuries until 1393, when it was taken by the Turks. It was in Tirnova on Oct. 5, 1908, that Prince Ferdinand of Bulgaria solemnly proclaimed the complete independence of his country and assumed the title of King. Pop., 1905, 12,171.

TI'RO, MARCUS TULLIUS. Slave, pupil, and subsequently amanuensis of Cicero, whose life he wrote and whose letters he collected. He is known chiefly as the inventor of the ancient stenography (see SHORTHAND), called after him Notæ Tironoanæ.

TIR'OL, or **TYR'OL,** *Ger. pron.* tē-rōl'. A Crownland of Austria, united with Vorarlberg under one administration (Map: Austria, B 3). Area about 10,305 square miles. Tirol like Switzerland is almost entirely covered by the Alps. It lacks lakes, however, the Lago di Garda on the south frontier being the only important one. Through the north extends the valley of the Inn, with the Lech Alps on the northwest. The Inn is the most important river in the crownland. It becomes navigable at Hall, just below Innsbruck. The watershed in Tirol between the Danube and the Po, separating northern from southern Tirol, is formed by the Oetzthal Alps on the west (reaching about 12,500 feet) and by the Zillerthal Alps towards the east. The Brenner Pass connecting Innsbruck with Verona, Italy, by an elevation of only 4500 feet lies between and marks the chief depression of the divide. In the Zillerthal group rises the Drave. It flows through the Pusterthal, and leaves Tirol on the extreme eastern boundary. The south end of Tirol is mainly occupied by the valley of the Adige, with the remarkable Dolomite Alps on the east. The Adige flows south and enters Italy west of the Lessinian Alps, which line the Italian frontier. The Sarnthal Alps lie in the centre of Tirol, at the eastern foot of the Oetzthal Alps. The Hohe Tauern (with the Gross Glockner peak, about 12,500 feet) forms the northeastern boundary, the Kitzbühl Alps lie on the Salzburg border, and the Ortler group enters from the southwest and forms the loftiest elevation in Tirol—12,790 feet. The mountains of Tirol are famous for their picturesque valleys. The climate is of great variety. The north slopes, as the Inn valley, are raw and cold, but the southern slopes, especially the Adige valley, are warm in summer.

Tirol is in general little adapted to tillage, the better portions being devoted mainly to meadows. About two-thirds of the surface is covered with forests. The agricultural sections are in the valleys in the northern and southern districts. Southern Tirol is noted for its wine, and it grows much fruit. Zinc and sulphur are mined; also some coal, iron, and copper. The industries are not extensive. Cotton goods are produced in the Inn Valley and silk goods in the Adige district. Spinning and weaving as house industries are conspicuous. The wood carving is famous. Carpets, iron wares, and marble are shipped, as well as cattle, lumber, and cheese.

There is a university at the capital, Innsbruck (1340 students in 1912). Tirol has a Diet of 68 members—34 representing the rural communities, 13 the towns, and 10 the landed aristocracy, the principal ecclesiastical dignitaries having seats in the body. The Statthalter in Innsbruck is at the head of the administration for Tirol and Vorarlberg, but Vorarlberg has its own Constitution and Diet. Tirol sends 25 members to the Lower House of the Austrian Reichsrat. The population in 1910 was 946,613, of whom the vernacular of 57.3 per cent was German and of 42 per cent Italian or Ladin. Over 99 per cent are Roman Catholic.

History. In Roman times Tirol formed part of Rhætia, which was conquered by the Romans, 14 B.C. At the time of the great migration of nations it was overrun by various German tribes, including the Ostrogoths. The southern portion later fell into the hands of the Lombards, and the northern became subject to the Bavarians, who were subdued by the Franks. Ultimately the country was divided into a number of petty lordships, some under the suzerainty of the dukes of Bavaria, some under that of the bishops of Trent, and others under that of the bishops of Brixen. The whole of German Tirol finally came into possession of one family, the counts of the Adige or of Tirol (the latter being the name of their castle, so called from the Roman Teriolis, near the site of which it stood). The last count, who died in 1335, left one daughter, Margaret Maultasch. She bequeathed her rights to her cousins, the dukes of Austria, who thus acquired possession of Tirol in 1363. The Italian slope remained in possession of the bishops of Trent, who were dispossessed in 1803. By the Treaty of Pressburg in 1805 Tirol was ceded to Bavaria, much to the discontent of the people, who were warmly attached to the house of Austria. They made a gallant resistance to the French in 1809, under Andreas Hofer (q.v.), but were defeated. Tirol was restored to Austria by the Treaty of Paris in 1814. The acquisition of Italian Tirol forms part of the programme of the Italian irredentists. Tirol was invaded by the Italians in the great war which began in 1914. See War in Europe; Irredentism.

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TIRPITZ, Alfred von (1849–). A German naval officer, born at Küstrin. He became a cadet in the Prussian navy in 1865, attended the Marineakademie in 1874–76, and rose through the grades to be admiral (1903). He commanded a cruiser division on the East Asia station in 1896–97, became Secretary of State of the Imperial navy, and plenipotentiary to the Bundesrat in 1897, and from the following year served also as Prussian Minister of State. Tirpitz was ennobled in 1900, and received the following orders: Black Eagle (1907), House of Hohenzollern, and Pour le Mérite (1915). In 1911 he was created Lord High Admiral of the Imperial navy. During the great war which broke out in 1914, he was prominent because, in his official capacity, he declared a war zone about the British Isles, within which vessels, neutral as well as belligerent, would sail at their own risk. To mark the zone he instituted a submarine blockade, a novelty in naval warfare. As the outcome of this policy, many belligerent and neutral vessels were destroyed by submarines, one of the most spectacular catastrophes being the sinking of the *Lusitania* (q.v.). The loss of American lives on such vessels severely strained the relations between Germany and the United States. Von Tirpitz retired in March, 1916, ill health being the reason given. See War in Europe.

TIRSO DE MOLINA, tēr′sō dȧ mō-lē′nȧ. See Tellez, Gabriel.

TIRURAY, tē′rōō-rī′. A Malay people found near the mouth of the Cottabato River in southwestern Mindanao. At the time of the Spanish conquest this tribe was very powerful, but later suffered so greatly from the slave raids of the Moro that they are now only a miserable remnant of the original population. See PHILIPPINE ISLANDS.

TI'RYNS (Lat., from Gk. Τίρυνς). An ancient city of Argolis, in the Peloponnesus, southeast of Argos, near the head of the Argolic gulf, not far from Nauplia (Map: Greece, Ancient, C 3). According to tradition it was founded by Prœtus, a mythic king of Argolis; and its massive walls, like other rude massive structures in Greece of unknown antiquity, were reputed to be the work of the Cyclopes (see CYCLOPEAN ARCHITECTURE). Later, Perseus was said to have ruled here, and Hercules resided there while in servitude to Eurystheus. At the time of the Dorian conquest Argos seems to have secured the supremacy over the plain, though during the Persian wars Tiryns was independent and sent troops to Platæa. Some time later, probably about 468 B.C., the city was taken by the Argives; after this period Tiryns remained uninhabited, the walls of the citadel only being left standing, the wonder and admiration of later ages. The acropolis or citadel of Tiryns was built on the summit of a low, flat, rocky hill, about 980 by 330 feet in extent, which rises abruptly out of the dead level of the plain of Argos to a height of from 30 to 60 feet. It consists of three terraces, of which the highest was occupied by a prehistoric palace, the middle by lesser buildings, while the lowest has been scarcely explored, but seems to have contained only small structures. This hill was surrounded by a massive wall of huge blocks of limestone of irregular shape laid in a clay mortar. The original height is uncertain; in some places the wall is still nearly 25 feet high. The thickness around the lower terrace is not quite uniform, but does not exceed 26 feet; around the upper terrace it varies from 16 to the prodigious figure of 57 feet. A part of this wall was occupied by galleries and chambers, probably meant for the storing of provisions. The main entrance was on the east, and was reached by a ramp; on the west was a postern gate with a stairway in the rock. The palace on the summit was excavated by Schliemann and Dörpfeld in 1884–85, and until the recent discoveries in Crete was the most complete example of the home of a Mycenæan king. After passing the entrance gate the way leads to a large propylæa, which opens into a great open court; from this a second gateway leads to another paved court (*αὐλή*, *aulē*), surrounded by colonnades. On one side low steps and a door lead to a vestibule, which again opens into the great hall (*μέγαρον*, *megaron*), with a circular hearth in the centre. Around this central structure is a complex of passages and lesser rooms, including a bath and a smaller court with its own megaron, probably the women's apartments. The essential identity of this palace with that described in the Homeric poems lends peculiar interest to the discovery. Recent excavations have shown another palace beneath the one described above.

Bibliography. Schliemann, *Tiryns*, Eng. trans. (London, 1886); Schuchhardt, *Schliemann's Excavations*, Eng. trans. by Eugenie Sellers (ib., 1891); Perrot and Chipiez, *Histoire de l'art dans l'antiquité*, vol. vi (Paris, 1894); Tsountas and Manatt, *The Mycenæan Age* (London, 1897); K. Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909); and the article "Archæology," in the NEW INTERNATIONAL YEAR BOOK for 1913, p. 52 (New York, 1914).

TISCHBEIN, tĭsh'bīn. A German family of artists who lived in Hesse during the eighteenth century. JOHANN HEINRICH, the ELDER (1733–89), a painter, born at Haina, studied first in Cassel, then under Van Loo, Boucher, and Watteau in Paris, and finally under Piazzetta in Venice. Returning to Cassel in 1754 he became court painter to the Landgrave and director of the New Academy (1776). His historical pictures and portraits in the style of the French eighteenth-century masters are well drawn, though affected, and rank among the best works of the time in Germany. Examples are: "Lessing" (Berlin) and Landgrave Frederick II (Cassel).—JOHANN FRIEDRICH AUGUST (1750–1812), also a painter, nephew of the preceding, was born in Maestricht. He studied with his uncle and in Paris and Italy. Afterward he became court painter in Waldeck and then director of the Leipzig Academy (1800). He was one of the finest colorists of his day. His canvases include nine pastel portraits of princes and princesses of Orange-Nassau (Amsterdam), and portraits of Schiller (1804; Leipzig), Wieland, and Mozart.—JOHANN HEINRICH WILHELM, the Elder (1751–1829), a painter and etcher, also known as the Neapolitan, cousin of the preceding, was the most celebrated of the family, though artistically the least gifted. He was born at Haina and studied with his uncle, Johann Heinrich, and in Hamburg, Bremen, and Holland. In 1779 he went to Italy, where he became intimate with Goethe, whom he accompanied to Naples. From 1789 to 1799 he was director of the Naples Academy. In 1809 he was made court painter to the Duke of Oldenburg. He was one of the chief representatives in Germany of the school of David. Among his paintings are a portrait of Goethe in the Campagna (Frankfurt) and 43 "Idyls" (Oldenburg). He issued about 150 etchings and engravings in connection with various publications. Consult: Michel, *Etude biographique sur les Tischbeins* (Lyons, 1881); Franz Landberger, *Wilhelm Tischbein* (Leipzig, 1908); Wolfgang Soerrensen, *Johann Heinrich Wilhelm Tischbein: sein Leben und seine Kunst* (Berlin, 1910); Hermann Bahlmann, *J. H. Tischbein* (Strassburg, 1911).

TISCHENDORF, tĭsh'en-dôrf, KONSTANTIN VON (1815–74). One of the most eminent textual critics and paleographers of the nineteenth century, born at Lengenfeld, Saxony. In 1840, as a privatdocent at Leipzig, he published his first edition of the Greek New Testament (dated 1841), and then went to Paris, where for over two years he labored incessantly among the manuscript treasures of the National Library. In 1842 the decipherment and publication of the Greek text of the important palimpsest Codex Ephraemi, followed soon after by his edition of the Codex Claromontanus, marked him as a textual scholar of the first rank. Though he became a professor of theology at Leipzig, the greater part of his time was spent in journeys in search of biblical manuscripts, and in editing and publishing the same, or in work on successive editions of the Greek New Testament. He discovered in 1844, at the monastery of St. Catharine at Mount Sinai, a few leaves of a manuscript of the Greek Old Testament. Fifteen years later, on a third visit, he discovered the remainder of the manuscript, the famous *Codex*

Sinaiticus, containing both the Old and New Testaments, one of the two oldest-known manuscripts of the Greek Bible. The crowning work of Tischendorf's life was his eighth edition (1865–72) of the Greek Testament with its large critical apparatus, the indispensable vade mecum of every student of the text of the New Testament. A list of Tischendorf's numerous publications may be found, with a sketch of his career, in the *Prolegomena* to the eighth edition by Dr. C. R. Gregory (Leipzig, 1884–94).

TISHRI, tīsh'rē. A month in the Babylonian, Persian, and Jewish calendars corresponding to the Seleucid *Hyperboretaios*, September–October. The Babylonian name *tish-ri-tum* is regarded as derived from *shurru*, to begin, to dedicate, the civil year having begun in the autumn with this month, while the ecclesiastical year seems to have begun in the spring with the month of Nisan. Tishri is not mentioned in the Bible, but the name is found in the Mishna treatise *Shekalim*, iii, 1, and probably in Josephus, *Antiquities*, viii, 4, 1. The Jewish civil year begins with the month of Tishri. See I. Benzinger, *Hebräische Archäologie* (2d ed., Tübingen, 1907).

TIS'IAS (Lat., from Gk. Τεισίας, *Teisias*). A Greek rhetorician of Syracuse, teacher at Athens, of Gorgias (q.v.), Lysias (q.v.), and Isocrates (q.v.), and author of a manual on rhetoric. Consult: F. W. Blass, *Die attische Beredsamkeit*, vol. i (2d ed., Leipzig, 1887); R. C. Jebb, *The Attic Orators from Antiphon to Isæos* (2 vols., London, 1876); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i, part i (6th ed., Munich, 1912).

TISIO, tē'zē-ō, BENVENUTO. See GAROFALO.

TISSAPHERNES, tīs'sȧ-fēr'nēz (Lat., from Gk. Τισσαφέρνης, from OPers. **Cithrafarnā*, possessed of manifold glory) (?–395 B.C.). A Persian, appointed satrap of the coast lands of Asia Minor by Darius II in 414 B.C. He played a part by intrigue and arms in the Peloponnesian War. He became the jealous rival of Cyrus the Younger on the latter's arrival in Asia Minor in 407 B.C., and when it became manifest that Cyrus was plotting against his brother, King Artaxerxes II, and aiming at the throne, Tissaphernes was the first to inform the King of the impending danger. He held a command in the Persian army and distinguished himself at the battle of Cunaxa (q.v.). After the death of Cyrus he entrapped the generals of the Greek mercenaries of Cyrus. He then succeeded to the provinces that had been held by Cyrus, but was unsuccessful in an attempt to establish his authority over Ionia. Finally, through the influence of Parysatis, the King's mother, Tissaphernes was put to death at Colossæ, in Phrygia, in 395 B.C.

TISSERAND, tēs'räN', FRANÇOIS FÉLIX (1845–96). A French astronomer, born at Nuits-Saint-Georges, Côte-d'Or. In 1863 he entered the Ecole Normale Supérieure. In 1866 he became professor in the lycée at Metz, where he only remained one month, being called by Leverrier to the Paris Observatory as adjunct astronomer. He received his doctor's degree in 1868, presenting a very remarkable thesis on the method of Delaunay, which he showed to be applicable to the calculation of the inequalities of all the planets and thus of a wider application than had been supposed by the inventor. In 1873 he became director of the observatory at Toulouse and professor of astronomy in the Faculty of Sciences in the university. In 1878 he succeeded Leverrier as member of the Academy of Sciences and became member of the Bureau des Longitudes. In the same year he was appointed professor of rational mechanics at the Sorbonne, and in 1883 was transferred to the chair of celestial mechanics. He took part in the French expeditions to Japan and Santo Domingo which observed the transit of Venus in 1874 and 1882 respectively. In 1892 he succeeded Mouchez as director of the Paris Observatory.

Besides the generalization of the method of Delaunay, which he continued till his death, he made observations for the determination of planetary orbits, on the ring of Saturn, on the perturbations of Pallas, the origin of comets and their capture by the larger planets, and gave also a valuable criterion for identifying a periodic comet. He also observed the shifting of the orbital plane of Neptune's satellite as a result of Neptune's ellipsoidal shape. In consequence of this shifting of orbit the retrograde motion of the pole of the satellite completes a cycle in 500 years. His principal work, *Traité de mécanique céleste* (4 vols., Paris, 1888–96), gives a complete account of the state of knowledge of that branch of astronomy up to the time of his death. Since 1884 he edited the *Bulletin astronomique*. He made many astronomical contributions to the *Bulletin* and to the *Comptes Rendus*, and also wrote *Recueil complémentaire d'exercises sur le calcul infinitésimal* (Paris, 1876; 2d ed., 1896). Consult Poincaré, "La vie et les travaux de F. Tisserand," in *Revue générale des sciences* (Paris, 1896).

TISSOT, tēs'sō', JAMES JOSEPH JACQUES (1836–1902). A French painter. He was born at Nantes, studied at the Ecole des Beaux-Arts under Lamothe and Flandrin, and first exhibited in 1859. After the Commune, in which he was accused of having taken part, he lived in England for 12 years, gaining recognition as an etcher and a painter of portrait and genre subjects. Until he was 50 years old Tissot's work dealt principally with the worldly aspects of Parisian life. The drawing in these works is always careful, and the coloring exact and finished. Examples of this style are "Faust and Marguerite" (Luxembourg) and "La Femme à Paris," the latter a series of demimondaines. Experiencing a change in his religious views about 1886, he left Paris and passed 10 years in Palestine engaged upon a series of 350 studies for his "Life of Christ." The series, which was purchased by a French firm for 1,100,000 francs, is now in large part in the possession of the Brooklyn Institute Museum. It is an attempt to portray the real environment of Christ, the cities, buildings, and habits of the country, as they were in his time, based upon the supposition that Oriental life has not changed materially since then. The details are painted with miniature faithfulness. At the time of his death Tissot had begun a similar set of illustrations relating to the Old Testament.

TISSUE, ANIMAL AND PLANT. See HISTOLOGY.

TISSUE, MUSCULAR. See MUSCLE AND MUSCULAR TISSUE.

TISZA, tīs'sŏ, KÁLMÁN (KOLOMAN) (1830–1902). An Hungarian statesman, born at Geszt, County of Bihar. He studied law and entered the government service. In 1855 he accepted a semiecclesiastical position in the Reformed church, and in 1859 he vigorously combated the attempt of the Austrian Minister of Public Worship, Count Leo Thun, to curtail the autonomy of the Protestant church in Hungary. In 1861 he was elected to the Diet and soon became the recognized leader of the opposition. Long opposed to the Ausgleich, Tisza finally, in 1875, united his followers with the Deák party and organized the new Liberal party. In the Wenckheim cabinet he assumed the portfolio of the Interior (March, 1875), becoming Premier in October. He retired from the ministry in 1890, but was regularly returned as a deputy from the city of Grosswardein until 1901. Consult his biography by Visi (Budapest, 1886).

TISZA, Stephan (Hung. István), Count (1861–). A Hungarian statesman, son of Kálmán Tisza (q.v.). He was born at Budapest, and was educated at the universities of Berlin, Heidelberg, and Budapest. He entered the Hungarian Ministry of the Interior in 1882 and in 1886 became a member of the Hungarian Parliament. In politics Tisza became one of the strongest supporters of the agreement and economic union with Austria. In 1898 he was instrumental in obtaining the passage of the Tisza law for the purpose of breaking up the policy of obstruction against the Bánffy cabinet. (See Bánffy, D.) As the leader of the Liberal party Tisza became Premier and Minister of the Interior in 1903, but was dismissed in 1906. At the same time he lost his seat in Parliament. He returned to power as Premier on June 9, 1913, holding office during crucial months of the European War. He opposed the proposed German plan of establishing a customs union and economic federation between the Central Powers and their allies. See Hungary.

TITAN. See Titans.

TITA'NIA. 1. An epithet of Latona, as the daughter of the Titan Cœus. Ovid uses the name for Diana and for Pyrrha, daughter of Epimetheus. 2. In Shakespeare's *Midsummer Night's Dream*, the fairy queen, wife of Oberon.

TITANIA. See Uranus.

TITANIC DISASTER. The Royal Mail steamship *Titanic* of the White Star Line, sailing on her maiden voyage from Southampton to New York with 2223 passengers and crew, was lost at sea by collision with an iceberg on the night of Sunday, April 14, 1912, and 832 passengers and 685 of the crew perished. Among those lost were John Jacob Astor, Archibald W. Butt, F. D. Millet, William T. Stead, and Isidor Straus (qq.v.). The *Titanic* was the largest ship in the world at the time, with dimensions: length, 852.5 feet; beam, 92.5 feet; depth, 73 feet 3 inches; draft, 34 feet 7 inches; gross tonnage, 46,328; net registered tons, 21,831; speed, 21 knots per hour. See Safety at Sea.

TITAN'IC IRON ORE. See Ilmenite.

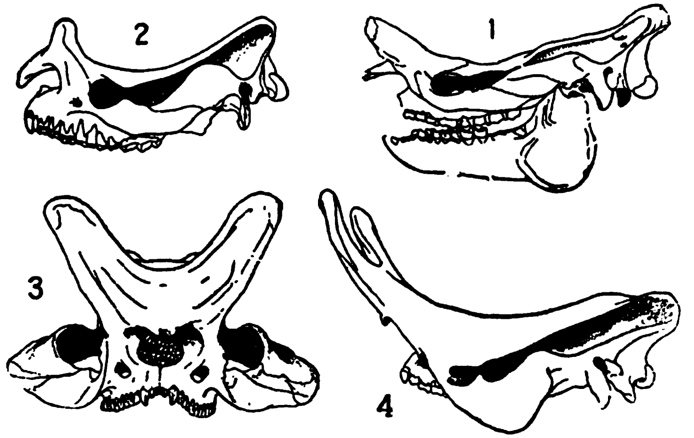
TI'TANITE (from *titanium*). A calcium titano-silicate which crystallizes in the monoclinic system. It has a resinous lustre, and is brown or black in color. It usually occurs in crystals embedded in granite, gneiss, mica schists, granular limestone, or in beds of iron ore and volcanic rocks. It is found in the St. Gotthard region, in Switzerland, Finland, and Ireland. In the United States it occurs in numerous localities along the Appalachian Mountains from Maine to North Carolina. The brown or black varieties are often called lederite in distinction from the lighter colored titanite called sphene. The latter transparent and colorless varieties are frequently cut as gem stones.

TITA'NIUM (Neo-Lat., from Lat. *Titan*, from Gk. Τιτάν, Titan). A metallic element discovered by Gregor in 1789. It is not found native, but as the oxide in the minerals anatase, brookite, and rutile; in combination with iron as ilmenite, and as the silicate with calcium in titanite. In smaller quantities it also occurs in other minerals. It may be prepared by heating the potassium titanofluoride (obtained from rutile) with potassium or sodium out of contact with air. In 1910 Hunter obtained titanium in a state of high purity by heating titanium tetrachloride with sodium.

Titanium (symbol, Ti; atomic weight, 48.1) is a steel-like metal that melts at about 1825° C. (above 3300° F.). Its specific gravity is 4.5. When heated to redness in the air it burns with an intensely brilliant white light. It can be dissolved in sulphuric, hydrochloric, or nitric acid. Metallic titanium readily unites with nitrogen at high temperatures. Titanium gives hardness and toughness to steel and a fine lustre to silver, while added to carbon used for arc lamps, it increases the brilliancy of the light. Titanium is also used for making filaments for incandescent lamps; its compounds have been recommended as excellent ingredients of paint for the protection of iron from the air; and, finally, titanium salts are at present used to a considerable extent in dyeing. The element combines with oxygen to form a monoxide, TiO, a dioxide, TiO_2, a trioxide, TiO_3, and a sesquioxide Ti_2O_3. Of these, the dioxide is found native and combines with bases to form titanates.

TI'TANOSAU'RUS, or Atlantosaurus. A genus of extinct, sauropodous, herbivorous dinosaurs (q.v.), found fossil in the Jurassic rocks of the Rocky Mountain region and Dakota, whose species were among the most gigantic land animals that ever existed, one specimen, exhumed in Colorado by O. C. Marsh, measuring about 60 feet long and standing about 30 feet high. The characteristics of the genus were similar to those of its near relatives *Brontosaurus* and *Diplodocus* (qq.v.).

TI'TANOTHE'RIUM (Neo-Lat., from Gk. Τιτάν, Titan + *θηρίον*, *thērion*, dimin. of *θήρ*, *thēr*, wild beast). The type genus of a family, Titanotheridæ, of ungulates, occurring in the Oligocene formations of North America, and comprising a number of species of gigantic animals somewhat resembling the rhinoceros in general form. Though belonging to the perissodactyls, they approximate the artiodactyls or even-toed ungulates in certain structural points, especially of the vertebræ and limb bones. The most striking feature of the titanotheres is a pair of bony processes resembling horn cores, which grow upward and outward from the maxillary bones above the snout. These prominences are variable in development according to age and sex, and also differ in size and form in different species to such an extent that many generic names, such as *Menodus*, *Brontotherium*, *Brontops*, and *Titanops*, have been bestowed upon forms which later study has shown to be only different stages in the evolution of the same genus. Careful comparative study of the remains from the White River beds of Canada, South Dakota, Colorado, and Nebraska shows that during the Oligocene period the genus increased in size, and the horns, which are mere knobs in the (presumably) earlier types, such as *Titanotherium heloceras*, increased greatly in length, and became flattened and wide spreading in the later species, culminating in the highly specialized *Titanotherium ramosum* and *Titanotherium platyceras*—the last survivors of their race. Of some 40 specific names which various writers have proposed, often on the basis of a single fragmentary skull, only a few designate sharply marked species. One of the best-known titanotheres is *Titanotherium robustum*, a form with moderately developed horns, which measured nearly 14 feet in total length, and 8 feet in height at the shoulder.



EVOLUTION OF THE TITANOTHERES.

1, skull of *Titanotherium bucco;* 2, cranium of *Titanotherium coloradense;* 3, front view of cranium of *Titanotherium platyceras;* 4, lateral view of same. (Osborn.)

TI'TANS (Lat., from Gk. *Τιτάν*, *Titan*, and *Τιτανίς*, *Titanis*). The offspring in Greek mythology of Uranus (Heaven) and Gæa (Earth). Their names as given by Hesiod were: Oceanus, Cœus, Crius, Hyperion, Iapetus, Cronos, Theia, Rhea, Themis, Mnemosyne, Phœbe, and Tethys. Dione, Phorcys, and Demeter are added by some writers. As Uranus imprisoned in the earth the Cyclopes and Hekatoncheires (100-handed monsters), Gæa in anger instigated the Titans to revenge. Cronos alone ventured to act. He surprised and mutilated his father and reigned in his stead. As Uranus had called down a like fate on the Titans, Cronos swallowed his children by Rhea as soon as they were born. Only Zeus escaped, his mother giving Cronos a stone wrapped in swaddling clothes. Later, Zeus forced Cronos to disgorge his offspring, and then began a war, in which he was aided by Themis, Mnemosyne, Styx, Prometheus, the Cyclopes and Hekatoncheires, as well as by his brothers and sisters. Iapetus and Cronos are the representative Titans. After a long struggle the conquered Titans were cast into Tartarus and guarded by the Hekatoncheires. In the *Prometheus Unbound*, Æschylus represented the Titans as released and reconciled to Zeus, now firmly established as King of Heaven. The name Titan is given also to the descendants of the Titans, Prometheus, Hecate, Helios, Selene, etc. Consult: Maximilian Mayer, *Die Giganten und Titanen in der antiken Sage und Kunst* (Berlin, 1887); Otto Gruppe, *Griechische Mythologie und Religionsgeschichte,* 2 vols. (Munich, 1906); J. E. Harrison, *Prolegomena to Greek Religion* (2d ed., Cambridge, 1908); C. M. Gayley, *The Classic Myths in English Literature and in Art* (2d ed., Boston, 1911); A. B. Cook, "Zeus, God of the Bright Sky," in *Zeus, a Study in Greek Religion*, vol. i (Cambridge, 1914).

TITCHENER, tĭch'*e*-nẽr, EDWARD BRADFORD (1867–). An American psychologist, born at Chichester, England. He was educated at Malvern College and at Brasenose College, Oxford, where he graduated B.A., in 1890; in 1906 he received the degree of D.Sc. from Oxford. After taking his Ph.D. at Leipzig, he became assistant professor of psychology (1892) at Cornell University and subsequently professor (1895) and research professor (1910). At Cornell he brought the laboratory of experimental psychology to a point of great efficiency. He made numerous original investigations in the fields of sensation, affective process, attention, and action. Harvard, Clark, and Wisconsin universities gave him honorary degrees. He wrote: *An Outline of Psychology* (1896; new ed., 1902); *A Primer of Psychology* (1898; rev. ed., 1903); *Experimental Psychology* (4 vols., 1901–05); *Elementary Psychology of Feeling and Attention* (1908); *Experimental Psychology of the Thought Processes* (1909); *A Textbook of Psychology* (2 vols., 1909–10); *A Beginner's Psychology* (1915). He translated Külpe's *Outlines of Psychology* and other works, became the American editor of *Mind* in 1894, and associate editor of the *American Journal of Psychology* in 1895, and contributed to the NEW INTERNATIONAL ENCYCLOPÆDIA.

TIT'COMB, TIMOTHY. A nom de plume used by J. G. Holland (q.v.).

TITE, SIR WILLIAM (1798–1873). An English architect. He was born in London, where he was educated, and studied architecture under David Laing. His first work, assisting in rebuilding the church of St. Dunstan-in-the-East in the Gothic style (1817–20), established his fame. Among his best designs was that of Edward Irving's church in Regent Square, London (1827–28), and he was the architect of the Royal Exchange (1841–44), and of several palatial railway stations in France and England. From 1855 until his death he sat in Parliament for Bath. He was knighted in 1869. He was a man of varied attainments, a member of several learned societies, and published *A Catalogue and Description of the Antiquities Found in the Excavations for the Royal Exchange* (1848), and several essays and lectures.

TITHES (AS. *tēoþa*, a tenth part, from *tēon*, *tien*, *tȳn*, ten, Goth. *taihun*, OHG. *zehan*, Ger. *zehn*, ten). A tenth part of the produce of the land, which has from early times been a common rate in systems of taxation for civil and religious purposes. Tithing is still the prevailing method of taxation in Mohammedan countries. It was established and definitely regulated for the support of religion among the Hebrews. For the details of the Hebraic institution of tithes see Lev. xxvii, Num. xviii, and

Deut. xiv, where it is provided that the tribe of Levi, not having lands assigned to them as was the case with the other tribes, should draw their support from this system of taxation.

In the usage of the Christian churches tithes have been one of the methods employed in providing for the support of the clergy. (See STIPENDS, CLERICAL.) The system was urged as of moral obligation by the Apostolic canons, the Apostolic constitutions, and the writings of the Fathers, on the ground that the Christian priesthood continued that of the Old Testament. Many Church councils in the sixth, seventh, and eighth centuries confirmed the system; and at length the Emperor Charlemagne, by his capitularies at the beginning of the ninth century, formally established the tax within that portion of the ancient Roman Empire to which his legislation extended.

The introduction of tithes into England is ascribed to Offa, King of Mercia, at the end of the eighth century; and the practice was made general for all England by Ethelwulf, about the year 850. It would seem that at first, although all were required to pay tithes, it was optional with each to select the church to which payment should be made; but by a decretal of Pope Innocent III, addressed to the Archbishop of Canterbury in the year 1200, all were required to pay tithes for the support of the clergy of their respective parishes, and this parochial distribution of tithes has ever since obtained in England. Consult: B. Whitehead, *Church Law: Dictionary of the Statutes* (London, 1892); W. Easterby, *The History of the Law of Tithes in England* (Cambridge, 1888); R. Palmer (Lord Selborne), *Ancient Facts and Fictions Concerning Churches and Tithes* (2d ed., London, 1892); H. W. Clark, *A History of Tithes* (2d ed., ib., 1894); H. Lansdell, *The Sacred Tenth, Ancient and Modern* (ib., 1906). See CHURCH RATES.

TITHING. A territorial or personal division in early English history. The territorial tithing, a tenth part of the hundred (q.v.), dates from early Anglo-Saxon times. The personal tithing probably came in with the Normans, though many give it a place in Anglo-Saxon polity. It consisted of 10 men mutually responsible for one another, with a head pledge or tithing man to represent the whole. (See FRANKPLEDGE.) This officer survived as a petty parish official long after the system to which he owed his origin had decayed.

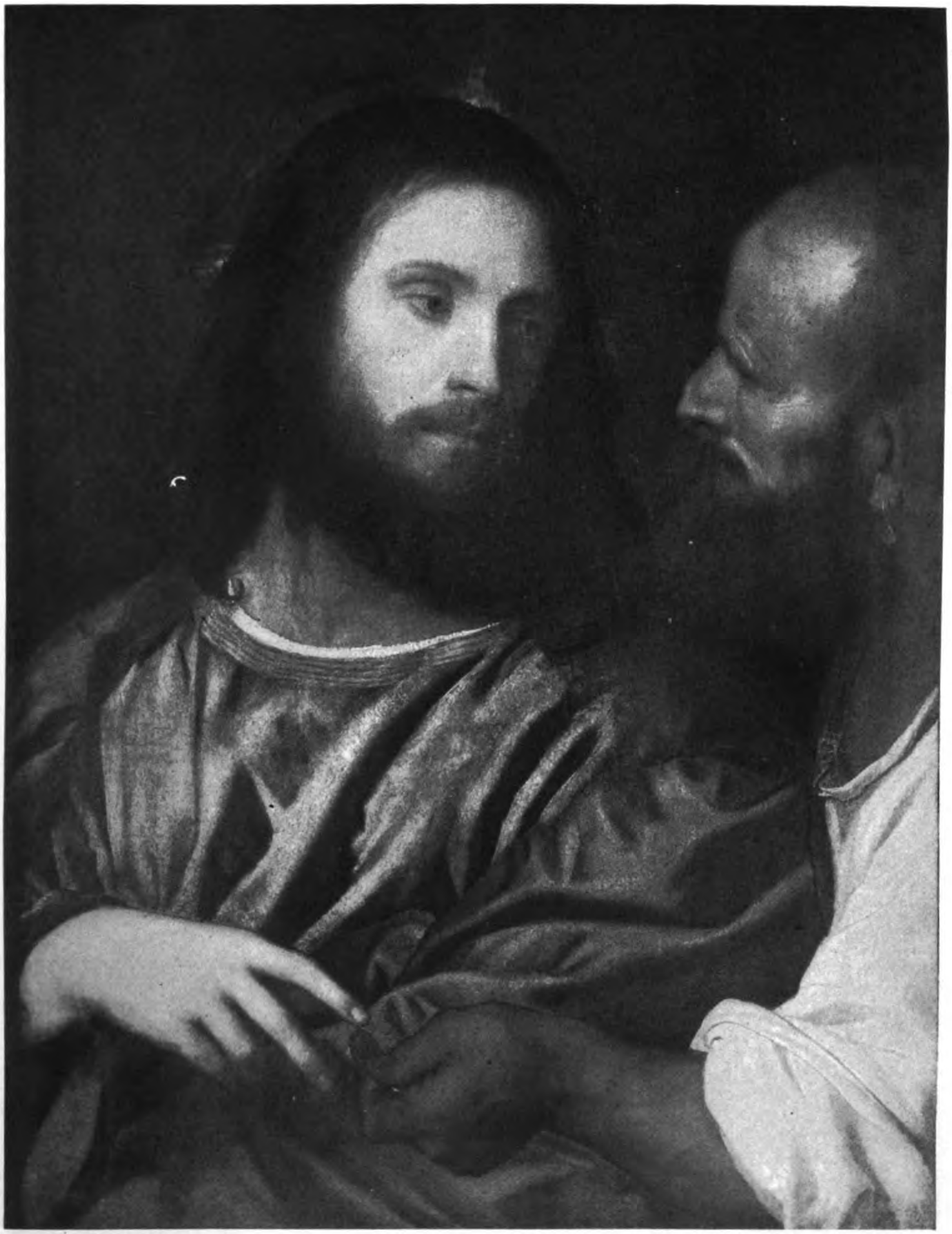
TITHO'NUS (Lat., from Gk. Τιθωνός). In Greek legend, a son of Laomedon and brother of Priam, who was carried off by Eos (the Dawn). (See AURORA.) She bore him Memnon, and obtained from the gods for him the gift of immortality. The Homeric hymn to Aphrodite adds that, since Eos forgot to ask for eternal youth, Tithonus withered into helpless old age, remaining behind closed doors, only his piping voice heard. A late account told of his final transformation into a cicada.

TITIAN, tĭsh'an (It., Tiziano Vecelli or Vecellio) (1477–1576). The most celebrated and important painter of the Renaissance in Venice, and one of the greatest painters of all times. He was born at Pieve di Cadore, a small town in the Alps of Friuli. The year of his birth has been variously given, the most probable assumption (1477) being based upon his own statement in a letter to Philip II of Spain. His family, the Vecelli, belonged to the petty nobility, and had long been identified with the public service in Pieve, Titian's father, Gregorio, being honorably known as a magistrate and military commander. At nine the lad was sent to Venice in care of an uncle who lived there. He was first apprenticed to the mosaicist Sebastiano Zuccato, then to Gentile and Giovanni Bellini, having Giorgione and Palma Vecchio as fellow pupils. His development was slow and while Giorgione lived, he was content to follow in his footsteps. His work also had much in common with that of Palma Vecchio, but in this case Titian was probably the controlling influence.

During the first part of Titian's early period, lasting till 1512, his style resembles that of Giorgione, except that it is more rugged and the lines and colors are not so soft and melting. To this early period belong a "Madonna with Saints" (Liechtenstein collection, Vienna); a "Holy Family" (National Gallery, London); and the so-called "Gypsy Madonna" (Imperial Gallery, Vienna). They show uncertainty of drawing, but much charm of color. The first of his pictures that can with surety be dated is "Pope Alexander VI Commending Jacopo Pesaro to the Madonna" (1502–03, Antwerp). A higher phase of technical development is shown by the "Madonna with the Cherries" (Imperial Gallery, Vienna), and the Madonnas with Saints at Dresden, Paris, Florence (Uffizi), and London (National Gallery). The "Concert," in the Pitti Palace, Florence (see GIORGIONE), has been attributed to him and the "Tribute Money" (Dresden), representing the incident between Christ and the Pharisee, is the most carefully finished of his pictures. Only Leonardo has created a Christ type that can vie with this in gentleness, intellectuality, and majesty, and the contrast between it and the cunning coarseness of the Pharisee is especially striking. The Uffizi also possesses his "Daughter of Herodias," for whom Titian's daughter sat as model. Other celebrated works are the beautiful allegory of the "Three Ages" (Bridgewater Gallery, London), and at the end of the period, summing up its best qualities, is "Sacred and Profane Love," more properly called "Medea and Venus," a remarkable contrast of the nude and vested figure in a beautiful sunny landscape.

The façade frescoes of the Fondaco dei Tedeschi (1507–08), which Titian executed as an assistant of Giorgione, have perished, but of those in Padua several survive, though not well preserved. One is in the Scuola del Carmine, and in the Scuola del Santo he depicted three miracles from the life of St. Anthony (1511). It was probably after his return to Venice in 1512 that he painted the well-known altarpiece of Santa Maria della Salute, representing "St. Mark Enthroned" with four other saints.

In 1513 Titian was summoned to Rome by Pope Leo X, but, preferring to remain at Venice, he petitioned the Senate to grant him a position like that of Giovanni Bellini, who was official painter to the state, and a commission to paint a large battle piece in the Hall of the Grand Council. This petition was granted, but when, upon the death of Bellini, Titian was named his successor, with a yearly pension of 300 crowns, he neglected the promised battle piece. He did, however, complete Bellini's picture, the "Submission of Barbarossa," in 1522, and executed a series of frescoes in the chapel of the Ducal Palace—both of which were de-



TITIAN
"THE TRIBUTE MONEY," FROM THE PAINTING IN THE ROYAL GALLERY, DRESDEN

stroyed in the great fire of 1577, but his fresco of "St. Christopher" (1523) still survives.

The work executed between 1513 and 1530 may be classed as belonging to a second part of Titian's early period. It still shows reminiscences of Giorgione, but also an increasing realism, breadth of treatment, and mastery of color. To this period belong most of his great altarpieces, beginning with the "Assumption of the Virgin" (1518), formerly the high altarpiece of the church of the Frari. Its position called for an over life-size figure and great breadth of treatment, the effects of which are lost in the present position of the picture in the Venetian Academy. The lower part is a scene of great exaltation among a group of the Apostles, the figures of Peter and John being particularly strong. Above the Virgin rises to the heavens in an effulgence of golden light, surrounded by hosts of the most beautiful angels imaginable. Another fine example is the Madonna painted for San Niccolò dei Frari (1523, Vatican Gallery), but the most perfect and important of his madonnas is probably the "Pesaro Madonna" (1526), still in the Frari. This very original composition represents the Madonna seated on the side of the picture at the base of a mighty column, where several saints commend to her the members of the Pesaro family. The celebrated "Death of Peter Martyr" (1530), destroyed by fire in 1867, survives only in an engraving. To the same period, probably, belong the "Noli me tangere" (Christ appearing to Magdalen), with marvelous balance of sentiment in figure and landscape, in the National Gallery, London, the delightful "Madonna with the Rabbit," "Holy Family," and the grandly dramatic "Entombment"—all in the Louvre.

Among Titian's mythological pictures of this period, chiefly painted for Alfonso, Duke of Ferrara, are the "Worship of Venus," in which numberless little Cupids disport themselves before a statue of Venus, a "Bacchanal" (both at Madrid), and "Bacchus and Ariadne" (National Gallery, London), a highly dramatic representation of fine coloristic quality. As state painter he had the monopoly of portraying the Doge. His official portraits perished in the fire of 1577, but many replicas survive, like that of the Doge Gritti (Czernin collection, Vienna). He found also a generous patron in Alfonso d'Este, Duke of Ferrara, whose reputed portrait, lately declared to be that of his son, Ercole II, is at Madrid. At Ferrara is a fine likeness of the poet Ariosto (National Gallery), now, however, properly attributed to Palma Vecchio, and there also is the idealized portrait widely known as "Alfonso d'Este and Laura Dianti" (Louvre), erroneously called "Titian's Mistress." The same model is portrayed in the "Flora" (Uffizi) with wonderful effect of light draperies. Other celebrated portraits belonging to this period are the "Young Man with a Glove" (Louvre), the portrait of an unknown man (Munich), and the so-called "Alessandro de' Medici" (Hampton Court).

The death of his wife, Cecilia, in 1530 was the cause of change in Titian's mode of life. In the quiet northeastern quarter of Venice he purchased a house which he furnished with great magnificence, and which speedily became the centre of a famous literary and artistic circle, which even kings joined when visiting Venice. In painting, his treatment grew broader and his work more powerful, and while his ideals grew more sensuous and realistic, it was a gracious and dignified sensuality. In 1531 he painted in the Ducal Palace the celebrated picture of the "Doge Andrea Gritti Presented to the Virgin by St. Mark," and in 1537 he at length finished the great battle piece of Cadore, both destroyed in the fire of 1577. The celebrated "La fede" (1555), a votive offering of Doge Andrea Grimani, had a better fate. Other decorative works are the ceiling of the choir and sacristy of Santa Maria della Salute, and the wonderful figure of "Wisdom," on the ceiling of the library of St. Mark (now the Royal Palace). Splendid decorative canvases of unusual size are the "Presentation of the Virgin in the Temple" (Venetian Academy) and the realistic "Ecce Homo" (Vienna).

In 1532 he was summoned to Bologna to portray Charles V and performed his task with such success that he was named court painter, Knight of the Golden Spur, and Count Palatine, with the privileges of the Spanish court, and his children were made nobles of the Empire. One of these portraits of the Emperor (1533) is at Madrid. Other celebrated portraits of this period are those of Ippolito de' Medici (Pitti Palace, Florence), the "Maltese Knight" (Madrid), and the so-called "Young Englishman" (Uffizi). Very fruitful for Titian's art were his relations (1532–38) with the Duke of Urbino, whose portrait in full armor, as well as that of his wife, Eleanora Gonzaga, is in the Uffizi. With subtle flattery he portrayed the lady's rejuvenated features in the celebrated "La bella di Tiziano," perhaps his finest female portrait, in the "Girl with a Fur Cloak" (Vienna), and in the "Venus of Urbino" (Uffizi), a rival of Giorgione's Venus, and the most beautiful representation of refined voluptuousness in modern painting. In 1545, after invitations from the Pope, Titian visited Rome, where he was received with highest honors. Of his portraits of Paul III an original is at St. Petersburg and an excellent copy in the Naples Museum, which also possesses the splendid psychological study of the Pope and his two nephews. At Rome he met Michelangelo, whose influence may perhaps be seen in the "Danaë" (Madrid) painted there. Other famous works executed about this time are the realistic "Venus," with the features of his daughter Lavinia (Uffizi), and a similar figure listening to music, at Madrid.

In 1548 Titian was summoned by Emperor Charles V to Augsburg, and there he painted that ruler's equestrian portrait in full armor (Madrid)—a wonderful characterization of the irresistible but disappointed master of Europe and the New World. Another portrait of Charles V (1548), in black costume seated in a loggia, is at Munich. At the same time Titian portrayed the captive John Frederick, Duke of Saxony (Vienna), and Cardinal Granvella (Besançon). He enjoyed the intimate friendship of the world-weary Charles V, and together they designed the "Trinity," the Emperor's last commission. After Charles's death Titian continued to serve his son Philip II, whom he portrayed repeatedly, as in the excellent example in possession of Mrs. T. J. Emery, Cincinnati.

It is impossible to mention even the important works of Titian during the last period of his long career (1530–76). Among religious pictures some of the most celebrated are a "Magdalen" (Pitti Palace); a "Madonna with St. John and Catharine" (National Gallery), celebrated for the landscape; "Christ at Emmaus" (Louvre); "St. Margaret"; and several others at Madrid. His mythological subjects include the celebrated "Venus and Cupid" (Borghese Gallery, Rome), "Jupiter and Antiope" (Louvre), and "Rape of Europa" (Gardner collection, Boston). Of his innumerable portraits we mention only those of his beloved daughter Lavinia, with a dish of fruit (Berlin), and as a bride and a matron (both at Dresden); of himself at Berlin, Vienna, Florence, and Madrid; his friend Aretino (1545, Pitti); Doctor Parma and the antiquarian Strada, in Vienna; and the splendid Cornaro family (Duke of Northumberland).

Titian's last pictures were chiefly religious, like the "Saviour of the World" (St. Petersburg) and the grand "Pietà" (Academy, Venice), finished after his death by Palma Giovane. In his hundredth year he was stricken by the plague, Aug. 17, 1576. He was buried in the Frari Church, where a fine modern monument marks his resting place. His son Orazio, an able painter and his faithful assistant, soon followed him. For Titian's important pupils, see Painting; Tintoretto.

If, as is the modern custom, painting be judged by the pictorial qualities only, then surely Titian is the greatest painter of Italy, if not of all times. All Venetian art centred in him. Certain painters of Venice and of other schools have equaled Titian in single pictorial elements, but no one united all these qualities with the same degree of excellence. His color is bright, but deep and transparent; a splendid golden tone suffuses his pictures, which only in his later work tends towards a more sombre brown. Light and shade, atmosphere and perspective are all perfectly rendered, and his rapid, sweeping handling, in place of the former detailed finish, revolutionized painting, preparing the way for Rembrandt and Velasquez. Being a Venetian, he was not as scientific a draftsman as the Florentines, though at best his drawing is good. His composition is always good, and at best it is excellent. He did not attempt, like the Tuscans, to make art the vehicle of intellectual ideas, but his grasp upon life was firmer than theirs, and his art was wider in scope. He preferred an art that was tranquil and serene, though at times—witness the "Assunta" and the "Peter Martyr"—he could be profoundly dramatic.

If Giorgione was the founder of the modern landscape, Titian did more for its development, achieving the highest perfection before Poussin and Claude. Eliminating the detail of former painters, he rendered the typical in a landscape with high poetic charm. Though he used landscape as only a setting for his figures, this setting was in itself perfect and complete. His favorite subjects were the Alps of his native Cadore and the lagoons of Venice. No one ever excelled him in the combination of powerful, sometimes merciless, realism, combined with noble and striking characterization. He was the greater painter of kings and nobles.

Bibliography. The most complete monograph on Titian is still Crowe and Cavalcaselle, *Titian: His Life and Times* (2 vols., London, 1879–81), which should, however, be supplemented by the more modern criticism of G. Morelli, *Italian Painters at Munich and Dresden*, Eng. trans. by C. J. Ffoulkes (London, 1893); Bernhard Berenson, *Venetian Painters of the Renaissance* (New York, 1894); and G. B. Rose, *Renaissance Masters* (3d ed., ib., 1908). Also: Max Jordan, "Tizian," in Dohme, *Kunst und Künstler des Mittelalters*, No. 72 (Leipzig, 1878); G. E. Lafenestre, *La vie et l'œuvre de Titien* (new ed., Paris, 1886); Giorgio Vasari, *Lives of the Most Eminent Painters, Sculptors, and Architects*, Eng. trans. by Blashfield and Hopkins, vol. iv (New York, 1896); C. Phillips, *The Earlier Work of Titian*, and *The Later Work of Titian*, in "Portfolio Monographs," Nos. 34, 37 (London, 1897–98); H. Knackfus, *Tizian* (Bielefeld, 1897); *Masters in Art*, vol. i (Boston, 1900); Oskar Fischel, *Tizian* (Stuttgart, 1904); Georg Gronau, *Titian and his School* (New York, 1904); S. L. Bensusan, *Titian* (London, 1909); Charles Ricketts, *Titian* (ib., 1910). An exhaustive and really satisfactory life of Titian has not yet been written.

TITIAN, The Spanish. See Navarrete, J. F. de.

TITICACA, tē′tē-kä′kȧ, Lake. The largest lake in South America (Map: America, South, C 4), situated on the boundary of Peru and Bolivia, being about equally divided between the two countries. It lies in a large and lofty lacustrine basin inclosed between the main Andean range and the Cordillera Real, with cross ranges on the north and south. This basin has an average elevation of 13,000 feet, and the surface of the lake itself lies about 12,500 feet above the sea. The lake has a length of 130 miles with an average breadth of 30 miles. It is divided by promontories into three unequal parts, and contains several islands. The depth in some places reaches 700 feet, but large portions of it are shallow, and the shores, especially in the south, are lined with marshy tracts covered with reeds. The vegetation along the shores is otherwise scanty, and the surrounding country is bleak and treeless. The lake receives a number of streams from the surrounding mountains, and discharges through the Desaguadero into Lake Aullagas, whose waters finally evaporate in the great salt marshes in the southern part of the closed basin. In former ages the lake occupied the whole of the basin. Its surface stood then much higher, and it discharged eastward into the Amazon. The region around Lake Titicaca was one of the seats of early Indian civilization, and contains many interesting architectural remains, some of which antedate the Incan periods. The most imposing of the ruins are those of Tiahuanaco (q.v.). (See Peruvian Archæology.) The lake was formerly navigated only by crude Indian rafts, but since the opening of a railroad to Arequipa and the Pacific coast steamboats have plied on it between the Peruvian and Bolivian ports. Consult A. F. A. Bandelier, *The Islands of Titicaca and Koati*, published by the Hispanic Society of America (New York, 1910), and A. A. Adams, *The Plateau Peoples of South America* (London, 1915).

TITIENS, tēt′yēns, Teresa. See Tietjens.

TITIES. One of the three patrician tribes of ancient Rome, the others being the Luceres and Ramnes.

TITI (tē-tē′) **MONKEY**, or Teetee. A small South American squirrel monkey (q.v.) of the genus formerly called *Chrysothrix* or *Callithrix*, now more correctly given as *Saimiri*, but the word is often used for a marmoset. They are gentle, beautiful, playful little creatures, in great repute as pets in their own country but too delicate to survive in cold climates.

TITLARK (from *tit*, from Icel. *tittr*, little bird, probably connected with Eng. *tit*, small thing + *lark*). A small, brown, terrestrial bird (*Anthus pennsylvanicus* or *rubescens*) of the wagtail or pipit family (Motacillidæ), allied to the larks, and familiar throughout North America during its migrations. It breeds, nesting on the ground, in the far north, and winters in the tropics, and in spring gives a pleasing song. A near relative is the Missouri skylark (*Neocorys*, or *Anthus*, *spraguei*), of the Western plains, whose habits and song, uttered while soaring in the air, closely resemble those of the skylark. In this group come the numerous European wagtails (*Motacilla*), which keep near streams and flirt their long tails incessantly, and the pipits (*Anthus*), several species of which are among the most pleasing of European summer birds, frequenting fields, open spaces, and rocky slopes, and singing much like finches. Consult Elliott Coues, *Birds of the Northwest* (Washington, 1874). See WAGTAIL.

TITLE (OF. *title*, *titre*, *tiltre*, Fr. *titre*, title, from Lat. *titulus*, title, superscription, token). The union of all the elements which constitute legal ownership of property, or the means by which a person holds property. The common-law authorities are to the effect that there are three essential elements to a complete title: possession, the right of possession, and right of property. This is technically true, but the latter two requisites are practically interchangeable, and it is customary to speak of title as consisting of possession with right of possession. (See POSSESSION.) Title to property may be vested in one or a number of persons. All titles to real estate are acquired by descent or purchase. A title by descent is one which is acquired by an heir of a deceased person by virtue of the laws of intestacy and succession. Any other source of title is said to be by purchase. The latter term is used technically, as it includes other means than a bargain and sale, as, e.g., a devise of property in a will and a conveyance by way of gift. By virtue of the statute of limitations, 20 years' adverse possession of real estate will give the occupant a good title in most States. Title to personal property is generally transferred by delivery, although a writing such as a bill of sale is effective, and a contractual meeting of the minds of the parties, by which an intention to pass title is evidenced, will also suffice. Generally six years' adverse possession of a chattel will operate as a transfer of title thereto by operation of law. Title to patentable inventions is said to vest in the inventor by virtue of original acquisition, but the real source of ownership is really derived from the protection secured by the patent laws. A title may be capable of being established in a court of law and yet have such apparent defects as not to be readily salable. A court of equity will not compel a purchaser to accept a title which is not marketable. Consult the authorities referred to under ACCESSION; POSSESSION; PROPERTY; REAL PROPERTY; ETC.; and also see OCCUPANCY; TENURE; TITLE, REGISTRATION OF; TORRENS SYSTEM; ETC.

TITLE, ABSTRACT OF. See ABSTRACT OF TITLE.

TITLE, REGISTRATION OF. A system of registration of titles to land prevailing in England and many of the United States. The question of how to avoid the litigation and expense so often attendant upon transactions relating to real estate and the transfer of title to real estate has always been most perplexing. Many methods have been tried, varying from the early custom in most counties of England by which transfers were effected without any recording or registration, to the system of registration introduced into South Australia by Sir Robert Richard Torrens in 1857, by which titles were to be registered and in effect guaranteed by the government. (See TORRENS SYSTEM and consult authorities there referred to.) Until comparatively recent times the method prevailing in the United States consisted in the recording system by which title papers were transcribed at length on the public records of the county in which the land was situated. This form of recording was extended to deeds, mortgages, liens, foreign wills, and similar documents, and was chiefly effective in giving constructive notice to all the world of the existence of such instrument and the claim of the person recording it. This system is still in force and is being extended and made more effective in some States, notably New York, by the adoption by the registrar of uniform forms of deeds, mortgage and other papers customarily recorded, in this way greatly simplifying the search of titles. See REAL PROPERTY; RECORDING OF DEEDS; TITLE DEEDS.

TITLE, SEARCH OF. See SEARCH OF TITLE.

TITLE DEEDS. The instruments in writing which constitute the evidences of the title of the owner of real property. In England the title deeds are of great importance, and the purchaser, heir, or devisee of the land is entitled to the possession of the title deeds establishing the chain of title to his predecessor in title. Thus in England the deposit of the title deeds as security for a loan creates a lien on the land in the nature of a mortgage. Such is not the law generally in the United States, however, where the recording acts have dispensed with the necessity of having custody of the original documents of title. See ABSTRACT OF TITLE; CONVEYANCE; DEED.

TITLE INSURANCE. An agreement or undertaking by which the insurer, for a valuable consideration, contracts to indemnify the insured in a specified amount against loss or damage suffered because of defects of title to real estate in which he has some insurable interest. The business of title insurance is of comparatively recent growth. The first title insurance company was organized in Philadelphia in 1876, but the development of the business has been most rapid since about 1885. Contracts of title insurance are subject to the same rules as govern other classes of insurance contracts. The policy is usually granted upon written application, which is made a part of the policy and which contains statements or promises which are deemed to be warranties or conditions of the policy.

Generally the liability of the insurer is not limited in point of time, and the undertaking is to indemnify the insured against all loss or damage resulting from any defect in the title not known or specified in the policy, including defects in the chain of title and incumbrances of every description existing at the time the insurance is effected. When the undertaking of the policy is to indemnify against loss or damage only, the obligation incurred by the insurer is substantially like that of a grantor whose deed contains the usual covenants of warranty. (See COVENANT.) It is not unusual for the policy of title insurance to provide that the insurer shall take the property at an appraised valuation in the event that any defect of title is discovered rendering the title unmarketable.

There are also usually provisions contained in the policy that the insured shall notify the insurer of any claim or demand against the property founded on any defect of title insured against, and that the insurer shall be permitted to bring or defend actions in the name of the insured, but at its own expense, for the purpose of establishing that the title is free from such defect. When the insured is a mortgagor, provision may be made in the policy for the protection of a mortgagee of the property by a mortgagee's clause making the loss payable to the mortgagee, or the same result may be accomplished by issuing an independent policy in favor of the mortgagee.

There is no fixed method of ascertaining the amount of premiums in title insurance as is the case in life insurance. Experience has shown that the losses under title-insurance contracts have been comparatively small, and that in fact an important benefit to be derived from the policy of title insurance in addition to the insurance features is the painstaking and exhaustive examination of the title made by the insurer. In many cases, however, the insurance feature is of great importance, since there may always be defects of title which an examination of the record title may not disclose. Many title-insurance companies possess complete records and title maps of all real estate within the territory where they do business and have other special facilities for the expert examination of titles. The prospective purchaser of real estate within such territory, by applying for title insurance, may thus procure a complete examination of the title before the conveyance is made. The policy issued may, with the consent of the insured, be transferred to a subsequent purchaser of the property. This, however, is not customary except upon the payment of an additional premium. See CONVEYANCE; COVENANT; DEED; INSURANCE; RECORDING OF DEEDS. Consult T. G. Frost, *Treatise on Guaranty Insurance and Compensated Suretyship* (2d ed., Boston, 1909).

TITLES OF HONOR. Designations to which certain persons are legally entitled in consequence of possessing particular dignities or offices. Titles of honor may be divided into those of sovereignty, superior and inferior, nobility, greater and lesser, and titles of peculiarly official significance. Superior sovereign titles are emperor and king (qq.v.) and, in Turkey and Persia, sultan (q.v.) and shah. Czar and kaiser (qq.v.), from Cæsar, correspond to emperor. Inferior sovereign titles include grand duke (ranking next to king), duke, and prince (qq.v.) in some of the German states. The ruler of Monaco is also called prince. Eastern equivalents of the inferior titles are bey, khan (both post-positive), khedive, rajah (qq.v.). Greater nobility titles include, in descending scale, prince, duke, marquis, count (earl in Great Britain), viscount, and baron (qq.v.). In Great Britain there is no title prince outside of the royal family. In Austria there is no duke, except archduke (q.v.) (of the Imperial family), and in a few princely houses, where the term remains as a subtitle, but is not used; in Germany, no viscount; in Russia, no viscount, marquis, or duke, except grand duke (of the Imperial family). Lesser nobility titles include baronet and esquire (qq.v.), peculiar to Great Britain, and knight (q.v.), chevalier, and ritter, the last three being practically equivalent terms. There are also lesser nobility titles for the chiefs of Scottish and Irish clans, and such Eastern titles as bey, effendi, and pasha (qq.v.), all three post-positive. The titles of honor having peculiarly official significance are largely such ecclesiastical, military, and governmental terms as archbishop, general, governor, etc. Courtesy titles, distinct from true titles of honor, since their validity rests in custom rather than law, are given to the sons of the British nobility. A noble takes his highest title and is permitted to set aside an inferior title, usually his second, to be assumed by his eldest son. The younger sons of dukes and marquises have the courtesy title lord (q.v.) prefixed to their given name or surname, and the daughters of dukes, marquises, and earls prefix lady. The younger sons of earls and the sons and daughters of viscounts and barons are called honorable. In Great Britain the titles duke, marquis, earl, viscount, baron, and baronet are inheritable and are in English law considered a species of property and classed as incorporeal hereditaments. Among lesser dignities are the various orders of knighthood and the knights bachelors, but these are personal and not hereditary, and the same is true of the spiritual peers and the law lords of Parliament, who are created for life only.

Certain forms of reference are used in respect to various titles. Majesty is attributed to emperor and king, and to the former often Imperial Majesty; Imperial Highness to title of child of an emperor; Royal Highness to title of child of a king (in Great Britain also grandchild of the sovereign) and to grand duke and prince reigning; Highness alone or variously qualified to prince; in Great Britain, Grace to duke, Lordship to any other peer (q.v.). See DIGNITY; FORMS OF ADDRESS; NOBILITY; PEER; PRECEDENCE.

TIT'MARSH, MICHAEL ANGELO. The nom de plume under which Thackeray published the *Yellowplush Papers* and other works.

TIT'MOUSE' (from *tit*, from Icel. *tittr*, little bird + ME. *mose*, AS. *māse*, OHG. *meisa*, Ger. *Meise*, sort of song bird). One of a family (Paridæ) of small active birds allied to the nuthatches, and familiar in the United States as chickadees. The family is widely distributed and exhibits much variety in appearance and habits. Typical colors seem to be black, gray, and white, but many Old World species are distinctly marked, or suffused, with tints of blue, red, brown, or yellow, or several of these; and the Western American genus *Auriparus* (see GOLDTIT) is thus gayly colored. The fe-

TITMOUSE.
Head of an Arizona crested titmouse (*Bæolophus wollweberi*).

males and young are closely like the males. These cheerful little birds are everywhere familiar, coming about gardens and roads, and nesting year after year in orchard trees, or some in garden bird boxes, as well as in the forest. Their food consists mainly of insects, and they are everywhere of great service by their consumption of these, and, especially in winter, of the eggs and hibernating larvæ of aphids and other minute pests. Most of them make nests of soft materials in holes and crannies, but some, like the European penduline tit (see Plate of PENSILE NESTS OF BIRDS in article NIDIFICATION), the long-tailed tits of the genus *Acredula*, and the Western American bush tits (*Psaltriparus*), weave bag-shaped pouches of hempen materials, or of moss or grass, suspended beneath a tree branch. The breeding habits of the whole group are interesting. Their notes are sharp, quickly repeated exclamations, varied by a few sweeter calls, and are well illustrated by the familiar chickadees (*Parus*, or *Penthestes*, *atricapillus*, *hudsonicus*, and others), which are among the most characteristic of North American resident birds. Consult A. H. Evans, "Birds," in *Cambridge Natural History*, vol. ix (New York, 1900), and American ornithologies.

TITTONI, tēt-tō′nē, TOMMASO (1854–). An Italian statesman and diplomat. He was born in Rome, and was educated at the university there and at Oxford. He was elected a member of the Chamber of Deputies in 1886, was appointed prefect of Perugia in 1897 and of Naples in 1900, and in 1901 became Senator. In 1903–06 he was Minister of Foreign Affairs, which portfolio, after a short interval, he again held until 1910. He then became Ambassador to France. A volume of his speeches, *Sei anni di politica estera, 1903–09, discorsi* (1912), was translated into English as *Italy's Foreign and Colonial Policy* (1914).

TIT′ULAR BISHOPS (from Lat. *titulus*, title, superscription, token). In the Roman Catholic church, bishops other than diocesan, who take their titles from some formerly existing but now extinct see. The practice of so designating them is due to the ancient principle of not consecrating bishops without a definitely assigned sphere of labor. With the multiplication of suffragan and missionary bishops some such system of nomenclature was naturally, therefore, adopted. When the territory occupied by the Crusaders fell once more into Mohammedan hands the expelled bishops were utilized in various parts of Europe, retaining their former titles; and these titles, with those of sees which broke away from communion with Rome in the great Eastern schism, are still employed to designate coadjutor or missionary bishops. In England until 1850, and in Scotland until 1878, the Roman Catholic bishops bore such titles, owing to legal and other difficulties in the way of assuming territorial titles. Titular bishops were formerly often known as bishops in partibus infidelium; but in 1881 Leo XIII abolished the use of this name, on the ground that many of these sees had come into the hands of states which, if not Catholic, were Christian, and that the designation was inappropriate. See SUFFRAGAN.

TI′TUS. One of the most trusted and devoted of the disciples and fellow workers of the Apostle Paul. Nothing is said of Titus in the Acts, and all we know of him is contained in scattered notices in Paul's Epistles, especially Galatians and 2 Corinthians. He was of Gentile origin (Gal. ii. 3), converted to Christianity through Paul (Tit. i. 4), and was one of the brethren taken along by Paul and Barnabas on their mission from the church of Antioch to the mother church of Jerusalem at the time of the Apostolic Council (c.49 A.D.; cf. Gal. ii. 1 and Acts xv. 2). At Jerusalem, though he was uncircumcised, he appears to have been allowed to mingle freely with members of the mother church. It is reasonable to suppose that he returned to Antioch with Paul and accompanied him thence on his third missionary journey. From the notices in 2 Corinthians we learn that he was sent by Paul from Ephesus on two, perhaps three, missions to Corinth, bearing letters and intrusted with the management of delicate and important business. In all respects he was completely successful. The Corinthians contributed liberally towards the great collection Paul was raising for the Jerusalem church, willingly obeyed Paul's injunctions in regard to cases of discipline, and evidenced most sincere love and loyalty to the Apostle. These results were supremely satisfactory to Titus, and his report to Paul, who had left Ephesus (spring of 55 A.D.) expecting to meet Titus at Troas, but, disappointed in this, had pressed on anxiously into Macedonia, so cheered the Apostle that he at once sent back the warm-hearted message contained in 2 Cor. i–iv. We know no more of Titus's movements until the time of the letter written to him by Paul. The date of this Epistle, presupposing its genuineness, must be placed between Paul's first and second imprisonments. (See NEW TESTAMENT CHRONOLOGY.) Titus had accompanied Paul to Crete, where he had been left by the Apostle to organize further the churches there planted. He was summoned thence to join Paul at Nicopolis, where Paul planned to winter. We do not know whether this plan was carried out. Titus is next mentioned in 2 Timothy (iv. 10), the last of Paul's letters, as having departed, presumably from Rome, for Dalmatia. Nothing more is said of Titus in the New Testament. The impression made by the references given is that he was a true and capable assistant to the great Apostle, one of the foremost of that circle of loyal disciples through whom Paul accomplished his great work. Tradition makes him Bishop of Crete, but of this there is no early evidence. See TIMOTHY AND TITUS, EPISTLES TO.

TITUS (TITUS FLAVIUS SABINUS VESPASIANUS) (c.40–81 A.D.), Roman Emperor (79–81 A.D.). He was the eldest son of the Emperor Vespasian and Flavia Domitilla, and was born at Rome. Brought up at the court of Nero, he received an excellent training, and subsequently, as tribunus militum in Germany and Britain, and commander of a legion in Judæa under his father, proved his qualities as a soldier and a general. On his father's elevation to the Imperial throne Titus was left to prosecute the Jewish War, which he brought to a close by the capture of Jerusalem (Sept. 8, 70 A.D.) after a long siege. The news of the success was received with the utmost joy. On his return to Rome he obtained the honor of a joint triumph with Vespasian (71 A.D.). About this time Titus became his father's colleague in the Empire. He gave himself up to the pursuit of pleasure in all its forms, put to death various suspected persons very summarily, and even caused one of his guests, whom he justly suspected of conspiracy, to be assassinated as he left the palace. When, on the death of his father (79 A.D.), he became Emperor, his first act was to put a stop to all prosecutions for læsa majestas, which had abounded since the time of Tiberius (q.v.). The ancient and venerated buildings of Rome were repaired; new structures, such as the Baths of Titus (see Titus, Baths of), were erected; and the tastes of the populace were gratified by games on the most stupendous scale, which lasted for 100 days. Titus's beneficence was unbounded, and it so happened that during his brief reign there was the most urgent need of its exercise. In 79 A.D. occurred the eruption of Vesuvius, which overwhelmed Herculaneum and Pompeii and ruined numerous other towns and villages; in 80 A.D. a fire broke out in Rome, which raged for three days, destroying the Temple of Jupiter Capitolinus, which had just been rebuilt, and other public edifices, besides numerous houses; and in the tracks of these calamities followed a dreadful pestilence. Titus dealt out gifts with lavish hand to the houseless and ruined sufferers; he even despoiled his palaces of their valuable ornaments to obtain money for distribution, and schemed and planned to furnish occupation for the afflicted. He was now the idol of his subjects, the "love and delight of the human race"; but, unfortunately, in the commencement of the third year of his reign he became suddenly ill, and died at Reate, in the Sabine country. The reign of Titus saw the extension of the Roman power in Britain. Consult the article "Flavius, 49," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. i (8th ed., Leipzig, 1914).

TITUS, Arch of. A triumphal arch in Rome at the highest point of the Sacred Way, facing the Forum, and situated between the Temple of Venus and Rome and the Temple of Jupiter Stator. It was erected by Domitian in 81 A.D. in commemoration of the taking of Jerusalem by Titus (70 A.D.) and is adorned with fine reliefs on the inner sides of the archway, representing the triumph of Titus, and the spoils of the temple, including the seven-branched candlestick and the table with showbread. During the Middle Ages the arch was built into the fortifications of the Frangipani; and when these were demolished the arch was taken down in 1822 and rebuilt to insure its safety, the missing portions being supplied by travertine instead of the original Pentelic marble.

TITUS, Baths of. Extensive baths northeast of the Coliseum at Rome, built by Titus (Thermæ Titianæ) on the ruins of the Golden House of Nero and supplied by the Aqua Marcia. Their exact situation was long a matter of dispute, and they were generally conceived to be identical with the Baths of Trajan and to have been called by the latter name because restored by him. Excavations in 1895 finally determined their topography and showed them to be distinct from the adjoining Baths of Trajan. Consult S. B. Platner, *The Topography and Monuments of Ancient Rome* (2d ed., Boston, 1911).

TITUS, Epistle to. A letter in the New Testament, attributed to the Apostle Paul. See Timothy and Titus, Epistles to.

TITUS AN'DRONI'CUS. The name of a tragedy usually included among Shakespeare's works, though it is now generally considered to have been only retouched by Shakespeare in 1589–90, on the foundation of an earlier play. It is alluded to by Meres in 1598 among Shakespeare's tragedies; but, though a quarto edition is said to have been printed in 1594, no extant copy is earlier than the quarto of 1600. Crude as it is, it belongs to the same type of play as *Hamlet;* both are dramas of revenge, after the fashion of Kyd.

TI'TUSVILLE. A city in Crawford Co., Pa., 38 miles southeast of Erie, on Oil Creek, and on the Pennsylvania and the New York Central railroads (Map: Pennsylvania, B 2). It has a public library and a hospital. In August, 1859, the first oil well in the United States was sunk here, and the city is still largely interested in the oil industry. It has oil refineries, large iron and steel works, radiator works, a tannery, cutlery works, silk mills, saw and planing mills, engine works, etc. Titusville has adopted the commission form of government. The water works and the electric-light plant are owned and operated by the municipality. Titusville was settled in 1796. On June 5, 1892, Oil Creek, swollen by a cloudburst, flooded the lower part of the city. Soon afterward several oil tanks gave way. The liberated oil, covering nearly the whole surface of the flood, became ignited, and the fire and flood together destroyed about 60 lives and fully one-third of the city. Pop., 1900, 8244; 1910, 8533; 1915 (U. S. est.), 8684.

TIUMEN, or **TYUMEN**, tyo͞o-mân'y'. A town in the Government of Tobolsk, west Siberia, on the Tura, at the east end of the Perm-Tiumen Railway line (Map: Asia, H 3). It is an important centre in the transit trade of Siberia and has shipbuilding yards, woolen mills, and tanneries. Pop., 1908, 33,791.

TIV'ERTON. A municipal and Parliamentary borough and market town in Devonshire, England, 14 miles north of Exeter (Map: England, C 6). There are important weekly markets, and great animal markets for cattle. There is a large lace factory, in which nearly 2000 hands are employed; there are also breweries and flour mills. Blundell's School, just outside the town, is one of the most important schools in the west of England. Pop., 1901, 10,382; 1911, 10,205.

TIVERTON. A town in Newport Co., R. I., adjoining Fall River, Mass., on the New York, New Haven, and Hartford Railroad (Map: Rhode Island, D 3). Cotton manufactures and fishing are the chief industries. Pop., 1900, 2977; 1910, 4032.

TIV'OLI (Lat. *Tibur*). An old town of Central Italy, Province of Rome, 19 miles east-northeast of Rome (Map: Italy, D 4). It stands on the slope of Monte Ripoli, one of the Apennines. Tivoli is walled and has a fortress. The surrounding hills are covered with olive trees. The vines of Tivoli are famed for a peculiar sort of grape, in great request for its firmness and luscious flavor, noticed as early as the time of Pliny the Elder. The stone called travertine, of which a great part of Rome is built, comes from quarries just below Tivoli. On the western slope of the town lies the famous Villa d'Este, of the sixteenth century. Within and without the city there are many monuments of antiquity. In a commanding position above the falls of the Anio stand the remains of two temples, one circular (so-called Temple of the Sibyl) and one rectangular (so-called Temple of Tiburtus), the former of which antedates the Christian era. In the neighborhood there are extensive remains of the Emperor Hadrian's magnificent villa, the villa of Mæcenas, remains of mausoleums, aqueducts, baths, etc. The place is much visited by tourists for its waterfalls, which are lofty and very picturesque. The Anio furnishes excellent water power, which since 1892 has been utilized for electric lighting both at Tivoli and at Rome, and for ironworks at the former town. Tibur existed as a town (according to ancient tradition) long before the building of Rome, under whose dominion it fell about 335 B.C. It was a favorite place of sojourn with Horace, who mentions it repeatedly. Consult K. Baedeker, *Central Italy and Rome* (15th Eng. ed., Leipzig, 1909).

TIVOLI, Plato of. See Plato of Tivoli.

TIXTLA, tēs′tlȧ, or Tixtla de Guerrero. A town formerly the capital of the State of Guerrero, Mexico, 5 miles east of the capital, Chilpancingo (Map: Mexico, J 9). The town is in a fertile, well-watered valley, with silver mines in the vicinity. An earthquake on April 14, 1907, destroyed Tixtla and two other towns in Guerrero. Pop., 1900, 6316; 1910, 6448.

TLACOLULA, tlä′kô-lōō′lȧ. A town of the state of Oaxaca, Mexico, 18 miles southeast of the city of Oaxaca (Map: Mexico, L 9). Pop., 1900, 5675; 1910, 4934.

TLACOTALPAN, tlä′kô-täl′pȧn. A Gulf seaport of Mexico, 50 miles southeast of Vera Cruz, at the mouth of the Papaloapán (Map: Mexico, L 8). Pop., 6300.

TLÁLPAM, tläl′pȧm. A town of the Federal District, Mexico, 10 miles south of the capital (Map: Mexico, C, D 10). It is a noted summer resort and each spring at Whitsuntide its church of San Antonio de las Cuevas is visited by thousands of pilgrims. Pop., 1910, 15,448.

TLATLAUQUITEPEC, tlȧ-tlou′kē-tȧ-pĕk′. A town of the State of Puebla, Mexico, 42 miles northwest of Jalapa. Pop., 1900, 9829.

TLAXCALA, or **TLASCALA**, tlȧs-kä′lȧ (Mex., land of maize). The smallest state of Mexico. Area 1534 square miles (Map: Mexico, K 8). It lies within the central plateau of Mexico at an elevation of about 7000 feet above the sea. Several mountain peaks rise on the west and the south frontiers. The Sierra Malinche has an altitude of 13,475 feet. The rivers are short and unnavigable. The chief industry is agriculture, and the principal products are cereals, especially maize. The state has good transportation facilities. Pop., 1910, 184,171. Capital, Tlaxcala.

The natives of Tlaxcala were of Nahuan stock (q.v.) and spoke the same language as the Aztecs, the dominant people of the Mexican Empire, but maintained their independence in spite of repeated attempts of the Aztec emperors to subjugate them. On the arrival of Cortés in 1519 he was at first fiercely resisted by the people of Tlaxcala, but they were defeated, and, submitting, furnished a large contingent to assist in the conquest of Mexico. In recognition of their services they were accorded special privileges under the Spanish government, and on account of their loyalty and fighting qualities numbers of them were afterward colonized at Saltillo, in Coahuila, and at Izalco, in Salvador, as a check upon the hostile inroads of the native tribes. The present population of Tlaxcala is chiefly of the aboriginal stock and language. They maintain many of their ancient beliefs and customs.

TLAXCALA, or **TLASCALA**. A Mexican town, the capital of the state of the same name, 58 miles east of the City of Mexico, on a branch of the Mexican Railway, running between Puebla and Apizaco, in the valley of the river Atoyac (Map: Mexico, K 8). The modern town, near the site of the Indian capital, has lost much of its former greatness. It contains the state house, and the ancient bishop's palace, probably the oldest Franciscan building in America, while near it are many remains of former Indian structures. The magnificent sanctuary of Ocotlán is one of the landmarks of the surrounding country. The principal exports are grain, hides, and cloth. Pop., 1900, 2715; 1910, 2812.

TLAXIACO, tlȧ-syä′kô. A town of the State of Oaxaca, Mexico, 63 miles northwest of the city of that name, on the headwaters of the Atoyac (Map: Mexico, K 9). It is an important commercial centre. Pop., 1910, 7847.

TLEMCEN, tlĕm-sĕn′. The capital of an arrondissement in the Department of Oran, Algeria, near the Moroccan frontier. It is 81 miles southwest of the city of Oran, with which it is connected by rail, and stands in an undulating country, everywhere irrigated and highly cultivated (Map: Africa, E 1). It is also connected by rail with its port, Rashgun, 37 miles distant. The town is accessible only from the southwest, the other sides presenting steeply escarped fronts. It is protected from the south wind by a range of mountains, 4200 feet in height, and is surrounded by the ruins of its ancient battlemented wall. It contains Roman Catholic and Protestant churches, magnificent mosques, synagogues, and a museum of interesting antiquities. The town is well supplied with spring water, and a basin under the walls 720 feet long by 490 feet wide and 10 feet deep, used for naval exhibitions by the ancient Tlemcen rulers, is now a reservoir. The district is covered with fruit trees of all kinds, of which the olive is one of the most valuable; cereals, tobacco, etc., are extensively produced. Besides the special markets, a daily market is held, at which cattle, wool, grain, and oils are sold. Ostrich feathers and cork are exported; and woolen goods, leather, saddles, slippers, and arms are manufactured. Pop., 1911, 39,874, more than two-thirds of whom were of native origin. Dating from 1002, Tlemcen has an interesting history under Berber, Arab, Spanish, and Turkish rule. It had about 100,000 inhabitants in the thirteenth century. It has been on the decline since the early part of the sixteenth century. The French ultimately occupied it in 1842.

TLIN′KIT, or Tlingit (people), or Kolosh (Russ., from Aleut *kalosh*, *kaluga*, little trough, in allusion to the enormous and peculiarly shaped labrets worn among them, especially by the Sitka). A group of tribes, of which the Auk, Chilkat, Henya, Huna, Hutsnuwu, Kake, Kuyu, Sitka, Stikine, Taku, Tongas, and Yakutat are still recognized. They constitute a distinct linguistic stock known as the Kolushan, occupying the coast and islands of southern Alaska from Mount St. Elias southward to the entrance of the Nass River. They are a seafaring people with strongly marked characteristics. Before the demoralization wrought by the advent of the white man they lived in permanent villages of solidly constructed houses of massive beams and great planks of cedar, each with its tall totem pole, and with corner posts also carved in totemic designs. Their canoes were hewn from cedar trunks, and their mats and cordage were woven from cedar bark fibre. They were expert stone carvers and copper workers. They were enterprising traders and controlled the trade from the coast to the interior tribes, using dentalium shells as a currency medium and setting great store upon the acquisition of property. They had two phratries, the Raven and Wolf, with descent in the female line, but the chieftainship was elective, being usually accorded to the most generous distributor at the ceremony of the potlatch (q.v.). Slavery was an established custom, slaves from other tribes being a staple article of trade and treated by their masters with great cruelty. The dead were cremated, excepting priests, whose bodies were wrapped in mats and deposited with their sacred belongings in grave houses on commanding cliffs. Their principal mythologic hero was the Raven, who brought fire to the people and set the sun and moon in their courses. They did not flatten the head, as did the more southern tribes, but wore labrets as marks of distinction and honor, the insertion of each successive larger labret being the occasion of a potlatch distribution. They were a warlike race, strong and well built, and regarded by the Russians as of superior intellect, but have deteriorated by contact with civilization. They numbered 4426 in 1910, and derive a large part of their subsistence by labor in the salmon canneries. Consult Krause, *Die Tlinkit Indianer* (Jena, 1885). See also Sitka; Yakutat.

TMESIS, t'mē'sis *or* mē'sis. See Etymology, Figures of.

T.N.T. See Trinitrotoluenes.

TOA, or **AITOA**. See Casuarina.

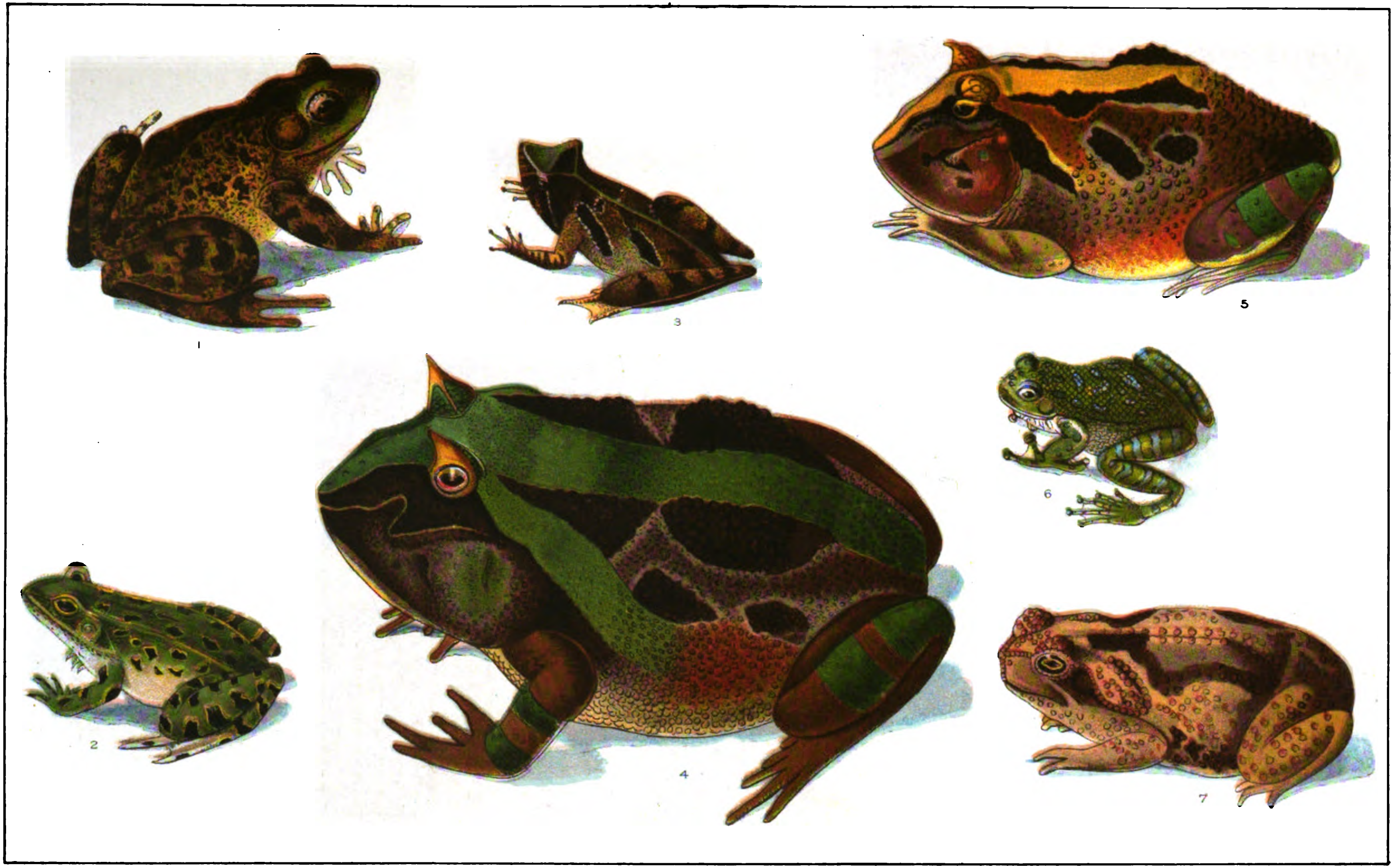
TOAD (AS. *tādige, tādie*, toad; of unknown etymology). The common name applied to any one of the numerous species of tailless Amphibia belonging to the family Bufonidæ and a few kindred families. More than 120 species belong to the typical genus *Bufo*, which is nearly cosmopolitan, but most numerously represented in tropical America, and absent from Madagascar, Papuasia, and the islands of the Pacific Ocean. Toads differ from typical frogs (Raninæ) in the absence of teeth, in having the sacral diapophyses dilated, and the sternum wholly cartilaginous. Most have a short-limbed, thickset figure and warty skin, and the majority are quite terrestrial or burrowing, but some are aquatic and others arboreal or aberrantly modified. There are eight genera in the family, besides *Bufo*. Noticeable among these are the common Australian toad (*Myobatrachus gouldi*), smooth-skinned; the repulsive egg-shaped, long-tongued, termite-eating Mexican species (*Rhinophrynus dorsalis*); and the large, warty, swimming toads of the East Indian genus *Neotophryne*.

The common toad of eastern North America (*Bufo lentiginosus*) is a fair type of the group. It reaches a length of about 3½ inches, is brownish olive, with a yellowish vertebral line and some brownish spots, but is exceedingly variable. The skin of young toads is nearly smooth, that of adults very warty. It contains many poison glands from which a milky somewhat acrid fluid exudes when the animal is roughly handled. This and the urine are harmless to man, but have a protective value against predatory animals.

The food of the toad consists of worms, insects, and snails, which must be alive and moving in order to attract its notice. These are seized by the rapid darting out of the tongue. (See Frog.) This fare is captured mainly during twilight and at night. The list of known foods embraces almost every sort of insect and larva, including many injurious to horticulture; there is no doubt that toads keep down pests. They molt the outer skin several times a year, struggling out of it, and then swallowing it. When cold weather comes they dig a hole in the ground, or find some warm, dry crevice among rocks, in a cellar, etc., and become dormant. This power of hibernation, and their ability to endure deprivation of food and water, tend to great longevity; toads under favorable conditions will live perhaps 30 years. The stories of buried toads surviving for long intervals in solid clay or rock, are usually unworthy of belief. Experiment has shown that no toad can long endure deprivation of air, water, and food, though in porous stone or moist soil they might remain alive for long periods. As soon as toads emerge in the spring their piping is heard, and they make their way to water, where fighting between males and mating begin. After a few days long gelatinous ropes of black holoblastic eggs, each about one-fifteenth of an inch in diameter, are to be found coiled or matted in warm ponds and roadside pools. Each female begins to breed when about four years old, and lays six to ten thousand eggs annually. These eggs rapidly develop into embryos, and hatch in four weeks or less, according to weather. The larvæ are considerably advanced when freed from the egg, and are provided with a peculiar temporary organ in place of the yet undeveloped mouth, by which they cling to weeds and similar supports; and with bushy external gills as breathing organs. There is no trace of limbs, but a swimming organ is present in the form of a large fin-bordered tail. Development proceeds rapidly. The true mouth is soon formed, and the tadpoles begin to feed upon the minute algæ coating the bottom and floating on the surface, and later eat animal substances. They are good scavengers for an aquarium. They keep in shallow water near shore, but are preyed upon by newts, turtles, fishes, and predaceous aquatic insects. Gradually growth advances, the fore legs appear, and later the hind legs are developed and the tail and gill tufts are gradually absorbed. (For experiments in rearing tadpoles under various food conditions, see Evolution, *Polymorphism*.) By midsummer the limbs are perfected, lungs have been formed, the tail is reduced to a stump, and the tadpoles emerge as small toads. Here they encounter enemies—birds, snakes, turtles, etc.—so that a very small proportion develop into adulthood, when they have few enemies except snakes.

The common toad of the Old World (*Bufo vulgaris*) is very similar to the American toad. It inhabits almost the whole Palæarctic region, eastward to China and Japan. India and the Malay Archipelago have a widely prevalent and very rough-skinned species (*Bufo melanostictus*), with the power of changing color. The green toad of the Mediterranean region (*Bufo viridis*) is highly variable in color; and the natterjack and panther toads (qq.v.) of western Europe resemble it. The largest member of the genus is the huge agua toad of tropical America. (See Agua.) Various more distantly related amphibians are called toads, e.g., tree toads (see Hyla; Tree Frog); the South American horned frogs (q.v.) of the cystignathine genus *Ceratophrys*;

AMERICAN FROGS AND TOADS



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1 BULLFROG - RANA CATESBIANA
2 LEOPARD - FROG - RANA VIRESCENS.
3 CRICKET-FROG - ACRIS GRYLLUS.
4 HORNED FROG (FEMALE) CERATOPHRYS DORSATA.
5 HORNED FROG (MALE) CERATOPHRYS DORSATA.
6 FLORIDA TREE-FROG - HYLA GRATIOSA
7 AGUA TOAD - BUFO MARINUS.

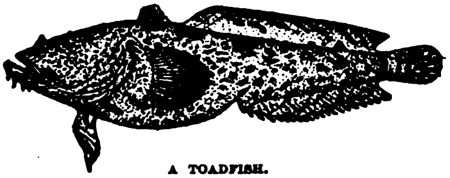
the Surinam toad (see Pipa), and others. Cf. Frog; Spadefoot.

Fossil toads are quite rare, but are found scattered through the Tertiary formations from the Eocene upward, especially in Europe. Some very fine skeletons of toads, and even remains of tadpoles, have been found in the fresh water Miocene deposits of Germany.

Consult: E. D. Cope, "Batrachia of North America," in United States National Museum, *Bulletin No. 34* (Washington, 1889); G. A. Boulenger, *Tailless Batrachians of Europe*, published by the Ray Society (London, 1896); Kirkland, "Habits, Food, and Economic Value of the American Toad," in Hatch Experiment Station, *Bulletin No. 6* (Amherst, Mass., 1897); Hans Gadow, "Amphibia and Reptiles," in *Cambridge Natural History*, vol. viii (London, 1901); M. C. Dickerson, *The Frog Book* (new ed., New York, 1914); and E. G. Boulanger, *Reptiles and Batrachians* (ib., 1914). See accompanying Colored Plate.

TOAD BUG. Any of the curious heteropterous insects of the family Galgulidæ. They have a short, broad body, projecting eyes, and dull, mottled colors, suggesting a miniature toad. They live in moist places along the banks of streams and ponds. About 20 species are known, of which three inhabit the United States, where the commonest species is *Galgulus oculatus*.

TOADFISH, or Sapo. One of a family (Batrachoididæ) of fishes allied to the gobies, the young of which fasten themselves to rocks by a central disk which is soon lost. They are small carnivorous and scavenging coast fishes of all warm seas, abundant about weedy rocks and coral reefs. They have a robust form, are inactive, and resemble toads in the mingled browns and yellows of their coloration. The species illustrated (*Opsanus pardus*) inhabits the Gulf of Mexico.



A TOADFISH.

TOADFLAX, Ramsted or Butter-and-Eggs (*Linaria*). A genus of plants of the family Scrophulariaceæ, distinguished chiefly by the spur at the base of the corolla and the capsule opening by valves or teeth. The species are herbaceous, natives chiefly of the colder and temperate parts of the Old World. Common toadflax (*Linaria vulgaris*) has an erect stem one to three feet high, with glaucous, linear-lanceolate leaves which thickly cover the stem, and terminal spikes of yellow flowers. It grows in fields along roadsides, etc., in Europe and America, where it has been introduced and where it is usually considered a troublesome weed. A monstrosity called peloria is sometimes seen in this plant, the flower presenting five spurs and five usually imperfect stamens.

TOADSTOOL. A fungus of the group Basidiomycetes (q.v.), whose spore-bearing body is usually a stalk bearing a cap. The name is often used in a popular way as applying to poisonous forms in distinction from the edible mushrooms, but this distinction is not one of classification. See Fungi, Edible and Poisonous; Mushroom.

TOAST (OF. *toste*, from ML. *tosta*, toast, Lat. fem. sing. of p.p. of *torrere*, to dry). Originally the name given to bread dried or scorched before the fire. As early as the sixteenth century toast formed a favorite addition to English drinks, especially sack and punch. The application of the word to a lady whose health is drunk, and thence to any sentiment mentioned with honor before drinking, is said to have originated from an incident described in *The Tatler* (No. 24, June 4, 1709), as having happened at Bath in the eighteenth century, when it was the fashion for ladies to bathe publicly, in elegant dresses made for the purpose. It happened that on a public day a celebrated beauty of these times was in the Cross Bath, and one of the crowd of her admirers took a glass of the water in which the fair one stood, and drank her health to the company. There was in the place a gay fellow, half fuddled, who offered to jump in, and swore, though he liked not the liquor, he would have the toast (meaning the lady). In the later sense, the word has been adopted both in French and German. Consult Edmund and Williams, compilers, *Toaster's Handbook* (White Plains, N. Y., 1914).

TOBA, tō'bȧ (opposite, so called by the Guaraní, as living on the opposite or western bank of the Paraguay). A powerful and savage people of Guaicuruan stock, the most important tribe of the Chaco region of northern Argentina. They rove along the Pilcomayo and Vermejo rivers. Their language is a dialect of that formerly spoken by the Abipone (q.v.), whom they exterminated about a century ago. They hunt and fight on horseback with the lance and bow, and are warlike and untamably hostile to all whites who attempt to enter the region. See Guaicuruan.

TOADFLAX (*Linaria vulgaris*).

TOBACCO (Sp. *tabaco*, *tabaco*, from the Carib name, of uncertain meaning; perhaps the name of the pipe smoked by the Indians, or of the tubes into which the leaves are rolled for smoking, or the Haitian name of the plant, or the old name of the island now called *Tobago*, near Trinidad, or the name of a province *Tobaco*, said to be in Yucatan), *Nicotiana tabacum*. A plant of the family Solanaceæ, cultivated for its leaves, which when cured are used for smoking, chewing and as snuff. It has broad leaves, terminal panicles of flowers, and two-celled, five-valved fruits (many-seeded capsules). It is a native of the Western Hemisphere, where the aborigines cultivated and used it from remote times. Its generic name is in honor of Jean Nicot, who introduced it into France in 1559 from Spain, where it had been introduced from Santo Domingo in the same year. In 1585 it was taken to England by Sir Francis Drake, and the practice of pipe smoking introduced among the Elizabethan courtiers by Sir Walter Raleigh. Its use rapidly extended throughout Europe, and soon became extensively prevalent among Oriental nations. Tobacco was at first recommended for medicinal virtues, but soon became an article of luxury.

TOBACCO (*Nicotiana tabacum*).

In America the culture of tobacco began in Virginia with the earliest settlement of the colony. It is recorded that in 1615 the gardens, fields, and even the streets of Jamestown were planted with tobacco, which immediately became, not only the staple crop, but the principal currency of the colony. The culture of tobacco was introduced into the Dutch colony of New York in 1646, though it never gained the same prominence there as farther south. Maryland, the Carolinas, Georgia, and later Kentucky, made it the leading crop almost from their first settlement. It long constituted the most valuable export of the colonies. From 1744 to 1776 the exports of the crop averaged 40,000,000 pounds a year. Its culture without the use of manure or fertilizer led to the injury of much land, and was condemned by thoughtful farmers like Washington.

As a commercial crop tobacco is now confined to rather limited areas in a few States. In the production of wrapper leaf for cigars Florida and Connecticut take the lead. Pennsylvania, Ohio, and Wisconsin produce a great deal of filler leaf for cigars. Chewing, smoking, snuff, and export types of tobacco are grown extensively in Kentucky, North Carolina, Virginia, Tennessee, South Carolina, and Maryland, in the order named.

The United States produces more tobacco than any other country in the world, about 35 per cent of the world's crop, and exports about one-third of the product, chiefly to the United Kingdom, Germany, France, Italy, Holland, and Spain. The tobacco crop of the United States in 1915 amounted to 1,060,587,000 pounds, grown on 1,368,400 acres, the average yield being 775 pounds per acre. The crop represented a value on the farm of $96,041,000. In 1913 the United States exported to foreign countries 444,371,661 pounds of unmanufactured tobacco, and imported for its use 66,899,275 pounds of leaf.

In addition to being the leading tobacco producer in the world, the United States is also the greatest exporter, the greatest importer, and the greatest consumer of tobacco. India is the second largest producer and likewise the second largest consumer, consuming most of its own tobacco. Russia is the third producing country, exporting and importing but little, and Austria-Hungary the fourth producing country, importing about a fourth as much as it raises and exporting about an eighth of its crop. The Dutch East Indies produce great quantities of leaf for export, and Japan nearly supplies its own needs. Germany raises an important crop but imports about two and a half times as much more. Turkey, France, Belgium, Italy, Greece, and Rumania produce considerable quantities, as do also Cuba, Porto Rico, Santo Domingo, the Philippines, and Mexico. Brazil leads among the South American countries.

Cultivation. The variety of tobacco planted depends upon soil, climate, and market demands. The plant is unusually susceptible to the effects of soil, fertilizers and climate, which affect the quality of the leaf. In the more northern regions the seed is sown in a hotbed and transplanted to the field in five or six weeks. Cultivation should be frequent and shallow and should cease when the plants begin to button. Where the production of seed is not desired the plants are topped to prevent flowering, that their whole strength may be directed to the leaves except in the case of that grown for cigar wrappers when a thin leaf is the more valued. Fertilizers affect the quality of tobacco more than the yield. Barnyard manure produces a rank growth but poor quality. Potash is the most important element to be supplied in growing tobacco, and the best forms are the carbonate and the sulphate. Nitrogen is best supplied in cottonseed meal, bone meal, and dried blood. Some types of cigar-wrapper tobacco, notably Sumatra, are grown under cheesecloth shade to improve the texture and quality of the leaf.

The crop is harvested by cutting down the stalk near the ground, or picking off the leaves. The method of curing depends upon the kind of tobacco and the use it is to be put to. In some cases heat is employed. After curing tobacco goes through the process of fermentation or ageing in which enzymes take part. This results in a reduction in the per cent of nicotine and the development of aroma.

Tobacco, owing to the high rate of duty when in any manufactured form, is mostly imported in the leaf; but small quantities are brought in, chiefly for reëxport, in various states of manufacture. The cultivation and manufacture of tobacco in foreign countries are frequently made government monopolies, and in some its cultivation is prohibited.

Classes of Tobacco. Variations in soil and climatic conditions, combined with the methods of culture and handling, give rise to certain well-defined types, and on these are based market requirements, as follows: cigar types—wrappers and binder leaf, and filler leaf; export types—dark fire-cured, and air-cured; and manufacturing types—burley, dark manufacturing leaf (including so-called onesucker variety and Virginia sun-cured), bright flue-cured (yellow tobacco), and Perique produced in Louisiana on a small scale. The requirements for cigar tobacco are very exacting, differing essentially from those for other types of leaf.

Tobacco Diseases. Among the various diseases of tobacco perhaps the best known is calico or mottled top, a Connecticut name for the mosaic disease of Holland and elsewhere. The mosaic disease is characterized by mottled light and dark green leaves a few weeks after the plants are set. As the disease progresses some of the thin areas dry out, giving a decidedly mottled appearance to the leaf. The diseased plants are usually irregularly distributed throughout the field. The cause has been the subject of much controversy, many observers claiming it is of bacterial origin, while others claim it to be due to certain enzymes which disturb the balance between the normal functions of certain cells. The spot disease is characterized by white or brown spots of various size and shape upon the leaves. In some cases the leaves resemble the spotted condition which is considered so desirable in some tobaccos, as the Sumatra wrapper leaf. The cause of the spot is not definitely known. In the seed bed tobacco plants are subject to several diseases that may be controlled by sterilizing the soil with steam. In the curing of tobacco two diseases, poleburn and stem rot, are common. Poleburn is likely to develop if long continued damp, sultry weather occurs while the plants are being cured. Certain fungi seem always present in this disease, as well as many bacteria. It may be prevented by artificial heat and ventilation. The stem rot is due to the fungus *Botrytis longibrachiata*. It attacks the stems and veins, producing patches of velvety white fungus and causing more or less decay. To prevent stem rot the tobacco barn should be thoroughly fumigated with sulphur fumes before and after curing a crop.

Tobacco Manufactures. The principal manufactured products are cigars and cheroots, cigarettes, smoking tobacco (for pipes and cigarettes), snuff and chewing tobacco—plug, twist and fine cut. Both the cigar and cigarette manufacture have been revolutionized by machinery. Although in cigar making there is still much hand work, cigarette making is more largely concentrated in factories. The manufacture and consumption of cigarettes in the United States has grown with marvelous rapidity, the increase in the decade ending 1913 amounting to over 450 per cent. The manufacture of smoking tobacco, formerly conducted by crude, hand methods, has also been modified by machinery and a great variety of forms, blends and flavors produced. The cost has been greatly lessened by machinery for packing. Fine-cut chewing tobacco is made in much the same manner as smoking tobacco, and the making of plug chewing tobacco is a comparatively simple process. Snuff making is the most complicated of all products. It is divided into two classes, dry and moist, each varying greatly in quality.

The internal revenue receipts from tobacco and the tobacco industry in the United States approximate $100,000,000 a year.

Indian tobacco (*Lobelia inflata*) has nothing in common with this subject. See LOBELIA.

Tobacco has been used as a sedative or narcotic over a larger area and among a greater number of people than any similar substance, opium ranking next, and hemp third. Tobacco leaves, when submitted to chemical analysis, yield nicotine, which is its most characteristic constituent, albumin, a gluten-like substance, gum, resin, malic and citric acids, and a large amount of inorganic constituents, 100 parts of the dry leaf yielding from about 19 to 27 per cent of ash, in which potash, lime, and silica preponderate. Nicotine (q.v.), the alkaloid contained in tobacco and considered a violent poison, does not appear in tobacco smoke. It is split into pyridine and collodine. Of these the latter is said to be the less active and to preponderate in cigar smoke, while the smoke from pipes contains a larger amount of pyridine. The question of the effect of tobacco on the human body is an old one, often discussed with a diversity of opinion and without definite conclusions. Studies made on man and the lower animals have helped to demonstrate important facts.

If tobacco possesses, like alcohol, opium, tea, coffee, etc., the power of arresting oxidation of the living tissues, and thus checking their disintegration, and if it also produces a nervous excitement which an immature body is unable to control, it follows that the habit of smoking must be most deleterious to the young, causing in them impairment of growth, premature manhood, and physical degradation. Smoked just after a meal tobacco is said to act as a digestive stimulant, and as a food when other forms of nourishment are not procurable. In some persons smoking increases, in others diminishes mental activity. Of special interest has been the action of tobacco upon the heart. And here nicotine seems to be the chief factor to be considered. It has been proved that this alkaloid affects the ganglion cells, interposed between the centre of the nervous system and the nerve endings in the heart, through the vagus and the sympathetic, thus effecting depression or acceleration of the action of the heart (tobacco heart), and constriction or dilation of the blood vessels. These changes, when becoming permanent, can be dangerous in their final results, upon circulation, respiration, and digestion. In affections, therefore, of these systems, as well as in nervousness, and in diseases of the nose, mouth, and throat, and of the eye (through the smoke) tobacco should be avoided. Otherwise, moderate use of tobacco by a healthy, mature person seems to be harmless, if not beneficial.

The different kinds of tobacco exert a different influence on the smoker according to the amount of noxious ingredients which they contain. Those which yield a small proportion are termed mild tobaccos. The use of tobacco in medicine has been entirely discontinued.

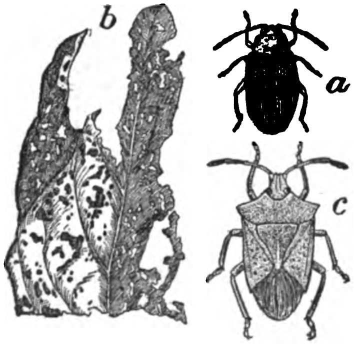
Bibliography. C. G. W. Lock, ed., *Tobacco Growing, Curing, and Manufacture* (London, 1886); A. M. and J. Ferguson, *All About Tobacco, Including Practical Instruction in Planting, Cultivation, and Curing* (Colombo, Ceylon, 1889); Killebrew and Myrick, *Tobacco Leaf:*

Its Culture, Cure, Marketing, and Manufacture (New York, 1897); B. W. Arnold, *History of the Tobacco Industry in Virginia* (Baltimore, 1897); J. B. Killebrew, *How to Cultivate, Cure, and Prepare for Market* (Nashville, Tenn., 1900); A. E. Tanner, *Tobacco from the Grower to the Smoker* (New York, 1912); E. H. Matthewson, "The Export and Manufacturing Tobaccos of the United States, with Brief Reference to the Cigar Types," in United States Bureau of Plant Industry, *Bulletin No. 244* (Washington, 1912); Carl Werner, *Textbook on Tobacco* (4th ed., New York, 1914).

TOBACCO-BOX SKATE. The common small American skate (*Raja erinacea*). See Plate of RAYS AND SKATES.

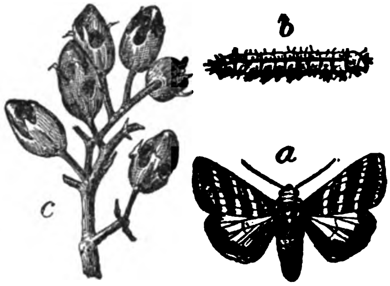
TOBACCO HEART. An irritable condition of the heart occurring in many persons who use tobacco to excess. Irregularity of cardiac action and debility are the chief symptoms, which clear up promptly on discontinuing the habit. See TOBACCO.

TOBACCO PESTS. The tobacco flea beetle (*Epitrix parvula*) is generally distributed throughout the United States. It is a minute, oval, reddish-brown species occurring upon many solanaceous plants, which appears in July, attacking the tobacco leaves, which soon become spotted. The spots become holes and the leaf is practically destroyed. In the larval state the insect feeds upon the roots. The small holes eaten by the beetles become entrance points for bacteria, which start a leaf disease often more injurious to the plant than the actual work of the beetles. The so-called horn worms, or horn blowers, of tobacco are the larvæ of two sphingid moths (*Protoparce carolina* and *Phlegethontius celeus*), large green caterpillars with oblique white stripes on the sides of the body, and the anal end of the body armed with a horn. These larvæ live upon tobacco leaves, transform to pupæ under ground, and the moths issue in May or June. The eggs are laid singly on the under side of the tobacco leaf just at nightfall. There are two generations each summer in a large part of the tobacco-growing region. Two insects, both larvæ of noctuid moths, are known as bud worms in tobacco fields. They are *Heliothis armiger* (also known as bollworm (q.v.), corn-ear worm, and tomato-fruit worm), which preferably lives in the ears of corn until the grain becomes hard, and therefore works in tobacco usually towards the end of the season, and *Heliothis rhexiæ*. The latter is the true bud worm. (See Colored Plate of AMERICAN MOTHS.) The adult is a small greenish moth, and the larva is found in the bud of the plant about the time it is ready to top. They transform to pupæ under the surface of the ground. A true bug (*Dicyphus minimus*) damages the second crop in late tobacco by puncturing the leaves and sucking the cell sap. Infested leaves become yellowish, somewhat wilted, and the older ones eventually split in places, becoming ragged. The bug, when immature, lives on the under side of the leaves, but the adults live both above and below. The eggs are deposited singly in the tissues of the leaf and hatch after four days. One entire generation is produced in 15 days. Several other sucking bugs puncture tobacco leaves, but are not serious enemies of the crop, except, perhaps, the green bug (*Euschistus variolarius*).



TOBACCO BEETLES.

a, tobacco flea beetle (*Epitrix parvula*), greatly enlarged; *b*, leaves, as damaged by this flea beetle; *c*, green bug (*Euschistus variolarius*).



TOBACCO BUD WORMS.

a, moth of the true bud worm (*Heliothis rhexia*); *b*, caterpillar of same; *c*, buds injured by false bud worm (*Heliothis armiger*).

The tobacco leaf miner or split worm (*Phthorimæa operculella*) hatches from eggs laid upon the leaves by a minute grayish moth, and bores between the surfaces of the leaf, making a flat mine often of considerable size. This insect is a cosmopolitan species and works upon potatoes as well as upon tobacco, boring into tubers as well as leaves. Several species of cutworms (q.v.) damage the tobacco plant early in the season. A mealywing (q.v.) (*Aleyrodes tabaci*) damages the leaves of tobacco in Europe and in the southern United States. The common mealy bug (*Dactylopius citri*) affects the plant, as also do several species of plant lice. Tobacco thrips (*Thrips tabaci*) is an enemy of tobacco in Bessarabia. It occurs upon plants in the United States, especially upon onions, but has not been found upon tobacco.

Most of the insects mentioned may be destroyed by spraying the plants with an arsenical mixture. Nearly all of them feed upon solanaceous plants, and a good plan is to allow a few weeds of this family—*Solanum nigrum* or *Datura stramonium*—to grow near the field which is to be planted to tobacco. These weeds act as traps for nearly all early tobacco insects, and they can be treated with heavy doses of Paris green for the leaf-feeding species, and with a spray of kerosene emulsion and water for the sucking bugs. Large numbers can thus be killed, greatly to the protection of the young tobacco plants.

Dried tobacco is attacked and frequently ruined, even after having been made up into cigars and cigarettes, by the so-called cigarette beetle (*Lasioderma serricorne*), an insect which works not only in tobacco, but in many other dried herbs as well as certain dried foods. It is a cosmopolitan species, and multiplies rapidly throughout the greater part of the year, feeding both as larvæ and as adults. The drug-store beetle (*Sitodrepa panicea*) and the common rice weevil (*Calandra oryza*) also feed upon dried tobacco. These insects are destroyed by fumigating the rooms or the establishments in which they occur with bisulphid of carbon or hydrocyanic acid gas.

All of the species above mentioned occur in the United States, although several of them are cosmopolitan. In Europe 144 species are recorded as occurring in tobacco fields. The most important of these, among the species which do not occur in America, is a tenebrionid beetle (*Opatrum intermedium*), which injures the plant by attacking the stems under ground. Consult L. O. Howard, *The Principal Insects Affecting the Tobacco Plant* (Washington, 1900).

TOBACCO PIPE. An implement for the smoking of tobacco. The use of a pipe for smoking herbs of various sorts dates from a period when these plants were burned in a container and the smoke employed for sacrifices or for healing. Aside from the specimens discovered in ancient sites in Europe, the greatest prehistoric distribution of the pipe is in America. Here the widespread primitive form is a drilled tube of stone, wood, bone, or pottery, in the form of a large cigar holder, evidently taking its shape from that of a tube of cane. This type is found almost exclusively west of the Mississippi, and its early use was for blowing out smoke and not for drawing it into the mouth. This form, when put into clay, shows a later transition towards the modern pipes by bending the stem. In the eastern United States the prehistoric pipe shows considerable modification of the original tube, and some of the varieties are the monitor pipe with the bowl set on a flat base perforated as a stem, hour-glass pipes, biconical pipes, etc. The peace pipe or calumet (q.v.) descends from the monitor form. The red stone called catlinite, commonly used for calumets, came into use in historic times. The Alaskan Eskimo pipe is of Asiatic form, with a very small cavity in a mushroom bowl attached to a stem, while the Labrador Indian pipe is of a well-marked type, consisting of a separate bowl of stone beautifully worked and a short stem. Numerous examples of sculptured pipes have been found in Ohio and Illinois, and have been attributed to the so-called mound builders. The tomahawk pipe was introduced through trade by the French, English, and Spanish, and certain tribes affected a certain style of this pipe.

The ethnographic study of the pipe or its modification and adaptation to their uses by different peoples shows not only that the spread of the pipe into different environments has given rise to a great number of inventions connected with this utensil, but that their forms, materials, and artistic conceptions have taken upon themselves racial or tribal individuality, as, e.g., Turkish and Chinese pipes. Most of the inventions have grown out of the desire to cool the smoke and relieve it of acrid principles, giving rise to the great class of water pipes widespread in Asia and Africa, as the hookah or narghile, and the ornate Chinese water pipe, and in other countries resulting in absorbing bowls, as the meerschaum, clay, brier root, or other substances, as well as devices for condensing the nicotine in a receptacle below the bowl, as in the German *lange Pfeife*. The same result is attained by the long stem of the pipe and by the long coiled tube of the narghile. The opium pipe of China is a special development with a large bowl having a small aperture, and a large flute-shaped stem designed for the inhalation of a small quantity of fumes from a pellet of burning opium. The hemp pipe of India is a form of water pipe in which tobacco or a mixture of tobacco and hemp may be smoked. The Chinese and Japanese prefer a pipe with a very small bowl in which a pellet of finely shredded tobacco is smoked. The Koreans use a larger bowl with an extremely long stem. In Africa the water pipe is rudely made of a cow's horn perforated for stem and bowl holder. It is said that a Kaffir lacking a pipe will often dig a small hole in the ground in which he puts tobacco, fit a stem in position below it, and, lying on his belly, enjoy a smoke. Consult: Nadaillac, *Les pipes et le tabac* (Paris, 1885); McGuire, *Pipes and Smoking Customs of the American Aborigines* (Washington, 1897).

TOBACCO WORM. See Tobacco Pests.

TOBA'GO or **TABAGO.** An island of the British West Indies, belonging to the Colony of Trinidad, and situated 22 miles northeast of the island of that name (Map: West Indies, G 5). Area, 114 square miles. It is of volcanic origin and is mountainous, with peaks rising about 2000 feet above the sea. The climate is warm, and the rainfall on the windward side amounts to 66 inches. The chief products are cotton, sugar, tobacco, coffee, rubber, and cacao, the bulk of which are exported. Pop., 1901, 18,750; 1911, 20,749, chiefly negroes. The chief town, Scarborough, had, in 1911, 729 inhabitants. The island was discovered by Columbus in 1498. It was successively held by the British, Dutch, and French, and was finally ceded to Great Britain in 1814.

TOBERENTZ, tō'be-rĕnts, Robert (1849–95). A German sculptor. He was born in Berlin, and studied at the Academy there and then under Schilling in Dresden. From 1872 to 1875 he was in Rome. After his return to Berlin he became a follower of Begas, in whose manner he executed, among other works, the bronze figure of a "Shepherd Resting" (1878, National Gallery). In 1879 he was appointed director of a master studio connected with the Breslau Museum, and after living in America in 1885–89 returned to Berlin in 1890 and became professor in 1895. He completed the "Luther Monument" of Paul Otto, in Berlin, modeled the equestrian statue of Frederick Barbarossa for the Kaiserhaus at Goslar, and made the statue of Frederick the Great for the Royal Palace in Berlin.

TOBIN BRONZE. See Alloy, *Bronze*.

TO'BIT, Book of (Gk. Τωβείτ, *Tōbeit*, Τωβείθ, *Tōbeith*, from Heb. *Tōbīyāh*, Yahwe is good). One of the deuterocanonical books (q.v.) of the Old Testament. The personage around whom the story of the book centres is Tobit of the tribe of Naphtali, who was carried away to Assyria by Shalmaneser. Here he obtains an official position with the King, but loses it under Sennacherib, and because he has buried certain Jews killed by order of the King, he flees from Nineveh. His nephew, Achiacharus (see Achikar), pleads with the successor of Sennacherib, and under Esarhaddon Tobit returns to Nineveh. Again he buries the dead, and while in an "unclean" condition he sleeps outside the wall of his courtyard and loses his eyesight. In his misfortune he is supported by his nephew Achiacharus, but, taunted by his wife, Anna, he sends his son Tobias to collect an outstanding debt in Rages in Media. Tobias takes with him as guide one Azarias (in reality Raphael, the angel). On the way Tobias is attacked by a fish, whose heart, liver, and gall he takes at the command of Raphael. They come to the house of Raguel, a kinsman of his, and Tobias marries Sarah, the only daughter of Raguel. By burning the heart and liver of the fish in the bridal chamber the evil spirit, Asmodeus (q.v.), who has already killed seven husbands of Sarah, is driven away. The debt collected, the three return to Nineveh, and Tobias applies the gall of the fish to his father's eyes and their sight is restored. Tobit dies at Nineveh and is buried there; Tobias dies at Ecbatana, yet not before he has heard of the destruction of Nineveh by Nebuchadnezzar. The book was probably written in the first half of the second century B.C. It is very generally held that it was composed in Egypt, on account of the flight of the demon to Egypt, and the dependence upon the Achikar story which was known to Egyptian Jews in the fifth century B.C., and possibly the stories of Khons and of the Grateful Dead. But it is not certain that, in the original text, the demon fled to Egypt, and the matter does not seem to have any real bearing on the place of composition; the story of Achikar is likely to have reached the Jews in Yeb from Syria or Mesopotamia in its earlier Aramaic form (see Achikar; Elephantine Papyri). The similarity to the story of Khons is very slight, and that of the Grateful Dead has not been found at all in Egypt. Tobit appears to have been written originally in Hebrew or Aramaic, and such terms as Ather and Athuria speak in favor of the Aramaic. In the Ptolemaic period, however, the Jews in Egypt wrote in Greek; an Aramaic book is more likely to have been written in Palestine. The geographical error of placing the Tigris between Nineveh and Ecbatana seems to exclude an origin in Adiabene, Media, or Mesopotamia. The emphasis upon the wickedness of exposing the dead, and the virtue of burying those that are exposed in public places, cannot be accounted for by the example of the patriarchs in Genesis; it is manifestly a protest against the Mazdayasnian custom of exposing the dead and the prohibition against burying them. The Greek manuscripts present three divergent types: Codex Vaticanus and Codex Alexandrinus probably represent the earliest, Codex Sinaiticus a somewhat later, and some minuscules as well as the Oxyrhyncus papyrus 1076 a mixed test. The Aramaic versions are made from the Greek, as are also the Latin, Hebrew, Syriac, and Ethiopic translations. Consult: A. Neubauer, *The Book of Tobit* (Oxford, 1878); Theodor Nöldeke, in *Monatsberichte der Berliner Akademie* (Berlin, 1879); J. Rendel Harris, in *American Journal of Theology*, vol. iii (Chicago, 1899); Max Löhr, in E. Kautzsch, *Die Apokryphen und Pseudepigraphen des Alten Testaments* (Tübingen, 1900); D. G. Simpson, in R. H. Charles, *Apocrypha and Pseudepigrapha of the Old Testament* (Oxford, 1913). See Apocrypha; Deuterocanonical Books.

TOBLER, tō′blẽr, Adolf (1835–1910). A Swiss Romance philologist, born at Hirzel, Canton of Zurich, and educated at the universities of Bonn and Paris. In 1867 he became professor at the University of Berlin, and in 1881 a member of the Imperial Academy of Sciences. His monographs on philological subjects are many, and his researches have contributed greatly to the knowledge of Old French syntax. In 1895 a Festgabe was presented to him by his pupils and friends. His publications include: *Gedichte von Jehan de Condet* (1860); *Mitteilungen aus altfranzösischen Handschriften* (1870); *Li dis dou vrai aniel* (1871; 2d ed., 1884); *Vom französischen Versbau alter und neuer Zeit* (1880; 4th ed., 1903; French trans., 1885); *Uguçon des Laodho* (1884); *Girard Pateg* (1886); *Vermischte Beiträge zur französischen Grammatik* (five series, 1886–1912; French trans., 1905); an edition of *Li proverbe au vilain* (1895). The first *Lieferung* of his monumental *Altfranzösisches Wörterbuch* appeared in 1915 (Berlin) under the editorship of E. Lommatzsch.

TOBLER, Titus (1806–77). A Swiss Oriental scholar. He was born at Stein, Canton of Appenzell, studied and practiced medicine, traveled in Palestine, and, after taking part in the political affairs of Switzerland, settled in 1871 at Munich. His principal work is *Topographie von Jerusalem und seinen Umgebungen* (1853–54), which was supplemented by *Beitrag zur medizinischen Topographie von Jerusalem* (1855); *Planographie von Jerusalem* (1858); *Dritte Wanderung nach Palästina* (1859); *Bibliographia Geographica Palestinæ* (1867). Consult H. J. Heim, *Titus Tober: Palästinafahrer* (Zurich, 1879).

TOBOG′GANING (from North American Indian *otobanask*, *odabagan*, sled). Coasting upon smooth slopes of snow or ice upon a special sled with no runners beneath its flat surface. It seems to have been improvised by the Indian hunters, who used it to bring in their game over the snow. With them it was simply a strip of bark turned up at the front and braced by strips or pieces of wood running both crosswise and along the edges. Among the Eskimos it was made from strips of whalebone. It is of the same primitive pattern to-day, except that in some cases a light rail runs along its sides. For recreation purposes it is usually made of thin strips of ash, maple, or hickory, slightly oval on the bearing surface, placed side by side and fastened at the ends, the under surface being highly polished. The ordinary toboggan is about 18 inches wide and 6 to 8 feet long. The steersman sits crouching, one leg bent, the other stretched behind him to be used as a rudder, for which purpose his moccasin has a hard leather steering tip. In some cities, especially Montreal, chutes are constructed for this sport. See Coasting.

TOBOLSK′, *Russ. pron.* tô-bôl′y'sk. A government of west Siberia (Map: Asia, J 2). Area, estimated at 539,659 square miles. The surface is flat with the exception of the northwestern part, which is covered with offshoots of the Ural Mountains, attaining an altitude of over 4000 feet. The larger part of the north belongs to the region of tundras and is practically uninhabited. The southern part is somewhat undulating and consists to a large extent of forest land and vast steppes, well watered and with a rich black soil which makes that part of the government one of the richest agricultural regions in the Empire. The chief waterway is the Obi (q.v.), which, with its great tributary, the Irtysh (q.v.), drains almost the entire region. Lakes are very numerous and some of them are salty. The climate is continental and severe, the average annual temperature varying from 24° F. at Berezov (q.v.) in the north to about 32° F. at Tobolsk in the south. Considerable quantities of grain are exported. Wheat and rye are the principal products. Dairying is a growing industry and the export of butter exceeds $1,500,000 per annum. The manufactures are chiefly paper, cloth, spirits, leather, and glassware. Of the population, estimated at 2,005,500 in 1914, the non-Russian element numbered only about 100,000, composed chiefly of Tatars, Ostiaks, Samoyeds, and Voguls.

TOBOLSK. The capital of the government of the same name in west Siberia, situated on the Irtysh, 172 miles north of Tiumen, the terminal of the North Siberian Railway (Map: Asia, H 3). It is well built and has a picturesque appearance with its Kremlin and numerous churches. The proximity of marshes makes the town unhealthful. Its importance has greatly diminished since the construction of the Trans-Siberian Railway, but it retains commercial importance, owing to its position at the junction of the Irtysh and the Tobol. Its chief industries are fishing and fur making. Tobolsk was founded in 1587 and is the ancient capital of Siberia. Pop., 1910, 21,405.

TOBY, M. P. See Lucy, Sir Henry.

TOBY, Uncle. A leading character in Sterne's *Tristram Shandy*. He is a retired sea captain, simple, kindly, and gallant, said to have been modeled on Sterne's father.

TOCANTINS, tō'kȧn-tēns', *Portug. pron.* tō'-kăɴ-tēɴsh', Rio. A large river of Brazil (Map: Brazil, H 3). It rises in the southern part of the State of Goyaz, and flows northward, emptying into the Atlantic Ocean through the large estuary known as the Rio Pará (q.v.), which communicates with the estuary of the Amazon. The total length of the Tocantins is about 1700 miles. About 600 miles from its mouth it receives the Araguayá (q.v.), which flows nearly parallel with, and exceeds in length, the main river from the point of confluence. The Tocantins is obstructed in several places by rocky reefs formed by spurs of the cordillera which it skirts. The last of these, the Falls of Itaboca, are situated below the confluence of the Araguayá, only 130 miles above the estuary, and completely obstruct navigation. Small steamers, however, ply on the upper reaches, though the country along the banks is very sparsely populated and its resources almost undeveloped.

TOCCATA, tôk-kä'tȧ (It., touched). In music, a term originally applied to compositions written for keyed instruments, thus having a somewhat more restricted meaning than sonata, a composition for any instrument. The oldest toccatas preserved are some written for the organ by Claudio Merulo (published 1598). They generally begin with full chords which gradually give way to passage work among which small fugato sections are interspersed. The modern toccato does not materially differ from that of Merulo.

TOCCOA, tŏk'ō-ȧ. A city and the county seat of Stephens County, Ga., 93 miles northeast of Atlanta, on the Southern Railway (Map: Georgia, C 1). Toccoa is both a summer and winter resort, being noted for its springs of chalybeate and sulphur waters, and for the famous Toccoa Falls, with a perpendicular descent of 186 feet. There are manufactories of cotton goods and yarns, furniture, and cottonseed oil. Pop., 1900, 2176; 1910, 3120.

TOCHER, tŏ'ɢēr (Ir. *tochar*, Gael. *tochradh*, dowry, portion). In the Scotch law, an ancient name for money or property given or settled by a father on his daughter at her marriage.

TOCHIGI, tō'chê-gê. A town in the Prefecture of Tochigi in central Hondo, Japan, 55 miles by rail north of Tokyo (Map: Japan, F 5). It is of some industrial importance and had in 1908 a population of 26,301.

TO'CORO'RO. A Cuban trogon (*Priotelus temnurus*), named from its cry. It breeds in holes abandoned by woodpeckers, and is remarkable for the concave outline of the end of its short tail.

TOCQUEVILLE, tôk'vêl', Alexis Charles Henri Clérel de (1805–59). A French statesman and political philosopher, born at Verneuil, in the Department of Seine-et-Oise. At the Restoration his father was made a peer of France. His mother was a granddaughter of Malesherbes, the academician, political writer, and magistrate, who defended Louis XVI at the bar of the Convention. Alexis de Tocqueville studied law, was admitted to the bar in 1825, traveled in Italy, and on his return became an assistant magistrate at Versailles. In 1831 he gave up his appointment at Versailles, and with his colleague there, Gustave de Beaumont, accepted a government mission to America, to study the working of the penitentiary system. The commissioners, after their return to Europe, published their report (*Du système pénitentiaire aux Etats-Unis*, 1832; Eng. trans., Philadelphia, 1833), an admirable work, which modified all the ideas previously entertained in France regarding prison discipline. An important result of his travels was his great work *De la démocratie en Amérique*, published in 1835. In his introduction he sought to show that a great democratic revolution had for centuries been going on in Europe. There is a general progress towards social equality. In France it has always been borne on by chance, the intelligent and moral classes of the nation never having sought to guide it. In America he found that the same revolution had been going on more rapidly than in Europe, and had indeed nearly reached its limit in the absolute equality of conditions. There, accordingly, he thinks we may see what may sometime happen in Europe. The work made a profound impression. Its author was elected to the Academy of Moral Science in 1836 and to the French Academy in 1841.

In 1835 De Tocqueville visited England, where he received an enthusiastic welcome from the leaders of the Whig party. In 1837 he was defeated as a candidate for the Chamber of Deputies from Valognes, but two years after he was elected by an overwhelming majority, and ranged himself with the Moderate Opposition party. After the February Revolution he was a formidable opponent of the Socialists and extreme Republicans, as well as of the partisans of Louis Napoleon. He became, in 1849, vice president of the Legislative Assembly, and from June to October in the same year was Minister of Foreign Affairs. During that time he defended the policy of the expedition to Rome, on the ground that it would secure liberal institutions to the states of the Church. After the coup d'état of December, 1851, he retired to Tocqueville, where he devoted himself to agricultural pursuits. In 1856 appeared his second great work, *L'Ancien régime et la révolution.* In June, 1858, he took up his abode at Cannes, where he died. De Tocqueville's *Œuvres et correspondance inédites* were published (1860) by his friend De Beaumont, who prefixed a biographical notice. His *Mémoires* are a valuable contribution to the history of the revolution of 1848 and the coup d'état. An English translation, *The Recollections of Alexis de Tocqueville,* was published in New York in 1896. Consult: H. Jacques, *Alexis de Tocqueville* (Vienna, 1876); Bryce, "The Predictions of Hamilton and de Tocqueville," and H. B. Adams, "Jared Sparks and Alexis de Tocqueville," in *Johns Hopkins University Studies in History and Political Sciences,* series 5, vol. ix, and series 16, vol. xii (Baltimore, 1887 and 1904); Henry Sidgwick, "Alexis de Tocqueville," in *Miscellaneous Essays and Addresses* (New York, 1904); also *Correspondance entre A. de Tocqueville et Arthur de Gobineau* (Paris, 1908).

TOCUYO, tô-kōō′yô. A town of the State of Lara, Venezuela, 180 miles southwest of Carácas, on the Tocuyo River. The valley of this river is one of the richest agricultural and grazing districts of the Republic, producing in abundance sugar cane, wheat, coffee, and cacao. Besides exporting these products Tocuyo has wool and leather manufactures, salt works, and household weaving. Tocuyo was founded in 1535. Pop. (est.), 4775.

TODAS, tō′dȧz. A people of the Nilgiri Hills in southern Hindustan, considered to be of Dravidian stock. They are tall, well-built, dolichocephalic, with prominent nose, features approaching the Caucasian, full beard, black hair, and rather light-brown skin. They live a simple pastoral life and are concerned almost solely with the care of the dairy. They form a typical polyandrous community in which when a woman marries it is understood that she becomes the wife of her husband's brothers. Consult Marshall, *A Phrenologist Among the Todas* (London, 1873), and W. H. R. Rivers, *The Todas* (ib., 1906).

TODD, Alpheus (1821–84). A Canadian author and librarian. He was born in London, England, and went with his parents to Canada in 1833. In 1856 he became principal librarian and constitutional adviser to both Houses at Ottawa, and he expended £10,000 abroad in purchasing books for the parliamentary library. Upon confederation in 1867, he was appointed librarian to the Dominion Parliament. His writings on constitutional law and parliamentary government, which take high rank, include: *The Practice and Privileges of the Two Houses of Parliament* (1839); *Brief Suggestions in Regard to the Formation of Local Governments for Upper and Lower Canada, in Connection with a Federal Union of the British North American Provinces* (1866); *On Parliamentary Government in England* (1867); *On Parliamentary Government in the British Colonies* (1880).

TODD, Charles Burr (1849–). An American historian, born at Redding, Conn. In 1895 he was secretary of the committee appointed by Mayor Strong for the printing of early records of New York City. He wrote: *A General History of the Burr Family* (1879; 4th ed., 1902); *History of Redding, Conn.* (1880; 2d ed., 1907); *The Story of Washington, the National Capital* (1897); *The Real Benedict Arnold* (1903); *In Olde Massachusetts* (1907); *The Washington's Crossing Sketch Book* (1914).

TODD, David (Peck) (1855–). An American astronomer, born at Lake Ridge, N. Y., and educated at Amherst College. He was assistant to the United States Transit of Venus Commission in 1875–78, and his reductions of the observations were the first derived from the American photographs. He took charge of the Lick Observatory observations of the transit of Venus in 1882. He led eclipse expeditions to Japan in 1887 and 1896, to West Africa in 1889–90, to the Dutch East Indies in 1901, to Tripoli in 1900 and 1905, the Mars expedition to the Andes in 1907, and an expedition to Russia in 1914. His publications include: *A Continuation of De Damoiseau's Tables of the Satellites of Jupiter to the Year 1900* (1876; also extended back to 1665), used by American and foreign nautical almanacs; *A New Astronomy* (1897; new ed., 1906); *Stars and Telescopes* (1899); *Lessons in Astronomy* (1902).

His wife, Mabel Loomis Todd, daughter of Eben Jenks Loomis (q.v.), wrote on astronomy, travel, anthropology, etc., and edited the *Poems* and *Letters* of Emily Dickinson.

TODD, Henry Alfred (1854–). An American Romance philologist, born at Woodstock, Ill. He was educated at Princeton (A.B., 1876), at Paris, Berlin, and Madrid (1880–83), and at Johns Hopkins (Ph.D., 1885), where he taught for several years. After holding the chair of Romance languages at Stanford in 1891–93, he became professor of Romance philology at Columbia. In 1910, with Raymond Weeks (q.v.) and other scholars, he founded the *Romanic Review,* the first learned review in English devoted entirely to the Romance languages. As a member of the advisory council of the Simplified Spelling Board, Todd took a prominent part in the reform of English orthography. In 1906 he was president of the Modern Language Association of America. Among his publications are *La panthère d'amour,* an allegorical poem of the thirteenth century, the first text to be edited by a foreigner in the series of the Société des Anciens Textes Français (1883); *Guillaume de Dole,* in which he showed that the so-called *Roman de la rose* of the Vatican is the unique text of an important poem antedating by about 40 years the first part of the celebrated *Roman de la rose* (1887); *La naissance du Chevalier au Cygne,* an important French poem of the twelfth century, embodying the earliest form of the Lohengrin legend (1889).

TODD, John (1800–73). An American Congregational minister. He was born at Rutland, Vt., and graduated at Yale College in 1822, and at Andover Theological Seminary in 1826. He was pastor successively at Groton and Northampton, Mass., at Philadelphia, and at Pittsfield, Mass. He was one of the founders of Mount Holyoke Female Seminary (later College). He had a vigorous and original mind, much practical shrewdness and wit, and fine descriptive power. Some of his works had a large circulation, especially *The Student's Manual* (1835; 20th ed., 1853). Dr. Todd wrote many books for children and young people. His complete works appeared in London (new ed., 1882, 6 parts).

TODD, Robert Bentley (1809–60). A British physician, born in Dublin, and educated there at Trinity College. The first part of his

Cyclopædia of Anatomy and Physiology was published in 1835 and the entire work was completed in 1859. Todd was professor of physiology and general and morbid anatomy at King's College, London, from 1836 to 1853. Todd was known for his pioneer work in the treatment of fevers and inflammations. He published several medical works.

TODDY CAT. See Palm Civet.

TOD'HUN'TER, Isaac (1820–84). An English mathematician. He was educated at University College, London, and at St. John's College, Cambridge. He was elected fellow of St. John's in 1845, and the rest of his life was devoted to mathematical writing and teaching, and to the study of philosophy and of languages. He was a fellow of the Royal Society (1862). Todhunter's textbooks were the most popular ones ever published in England. They include, besides a number of elementary textbooks: *Differential and Integral Calculus* (1852); *Analytical Statics* (1853); *Analytical Geometry of Three Dimensions* (1858); *History of the Progress of the Calculus of Variations During the Nineteenth Century* (1861); *History of Probability* (1865); *History of the Mathematical Theories of Attraction* (1873); *Researches on the Calculus of Variations* (1871); *Treatise of Laplace's, Lamé's, and Bessel's Functions* (1875); *History of the Theory of Elasticity* (posthumous, 1886). Consult: *Proceedings of the London Mathematical Society* (London, 1884), with list of writings; *Proceedings of the Royal Society*, vol. xxvii (ib., 1884).

TODHUNTER, John (1839–). An Irish author and scholar, born in Dublin, Ireland. He graduated in medicine at Trinity College, Dublin, in 1866, and continued his medical studies in Vienna and Paris. After practicing his profession for a time in Dublin, he became professor of English literature in Alexandra College, Dublin (1870–74). After traveling on the Continent and in Egypt, he finally settled in London. His work includes: *Laurella and Other Poems* (1876); *Forest Songs* (1881); *The Banshee and Other Poems* (1888); *Three Irish Bardic Tales* (1896); *Heine's Book of Songs* (1907), a translation. His dramas include: *Alcestis* (1879); *Rienzi* (1881); *Helena in Troas* (1885); *A Sicilian Idyll* (1890); *The Poison Flower* (1891); *The Black Cat* (performed in 1893). His prose comprises: *The Theory of the Beautiful* (1872); *A Study of Shelley* (1880); and *A Life of Patrick Sarsfield* (1895).

TODI, tŏ'dĕ. A town in the Province of Perugia, Italy, situated on an abrupt hill near the Tiber, 23 miles south of Perugia (Map: Italy, D 3). Its Etruscan origin is shown in its dilapidated walls and numerous tombs. Its fine remains of the Roman period include a temple or basilica, a theatre, and amphitheatre. The Romanesque cathedral has a huge tower and frescoes by Lo Spagna. The Renaissance Church of Santa Maria della Consolazione, a massive structure surmounted by a slender, soaring dome, is simple but wonderfully impressive. The splendid Gothic Palazzo Comunale contains a small picture gallery. Todi, the Umbrian Tuder, was the scene of the decisive victory of Narses over the Goths in 552. Pop. (commune), 1901, 16,561; 1911, 17,032.

TODLEBEN, Franz Eduard Ivanovitch. See Totleben, F. E. I.

TOD'MORDEN, *locally* tą'môr-dėn. A market-town in Lancashire, England, on the border of Yorkshire, 6 miles north-northeast of Rochdale. Cotton manufactures form the staple industry; coal abounds in the neighborhood, and there are foundries and machine works. Pop., 1911, 25,404.

TODY (from Lat. *todus*, sort of small bird). Any of several species of small West Indian birds forming the family Todidæ, and related to the kingfishers, bee eaters, and motmots (qq.v.). They are less than three inches long with a short tail and long bill. The plumage is brilliant, grass-green, carmine-red, and white. They breed in holes in banks and lay white eggs. The best-known species is the common green tody (*Todus viridis*) of Jamaica, a familiar and useful little bird, often called robin redbreast by English residents. The name tody is incorrectly applied to rollers, barbets, and other highly colored tropical birds, even in the East Indies. See Plate of Wrens, Warblers, etc.

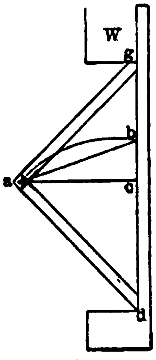
TOE, Wry. See Hallux Valgus.

TOFT, Albert (1862–). An English sculptor. He was born in Birmingham, and at first worked as a modeler with Wedgwood and Sons. He studied at the Newcastle-under-Lyme School of Art, and at the Royal College of Art, London, and first attracted favorable attention with his "Fate-Led" (1892; Walker Art Gallery, Liverpool). This was followed by "The Sere and Yellow Leaf" (1892); "The Oracle" (1894); "The Goblet of Life" (1894); "Spring" (Birmingham Museum); "Hagar" (1899); "Victory" (1900); and the "Spirit of Contemplation" (1901), perhaps his best effort. His ideal statues, although realistic in conception, show considerable imaginative quality, and the modeling is vigorous and sure. In another field are memorials to Robert Owen, Queen Victoria (Nottingham), and King Edward (Birmingham), the Welsh National War Memorial, and busts of several noted men. Toft also did good work as a medalist and decorative sculptor, and published *Modeling and Sculpture* (1911).

TOGA (Lat., mantle). The principal outer garment of the Roman citizen, worn over a shirt (*tunica*). For ordinary citizens the toga was pure white in color (*toga virilis, toga pura*); boys, and most of the magistrates, wore togas with a border of crimson (*toga prætexta*). At a triumph (q.v.), the victorious generals appeared in a toga entirely of crimson embroidered with gold (*toga picta*), worn over a tunica of similar character (*tunica palmata*). Candidates for public office presented themselves in togas freshly cleansed and artificially whitened (*candida*, shining). On the other hand, persons in mourning for any reason wore carelessly arranged and soiled togas (*sordida*), or even those artificially darkened (*pulla*). Its material was wool, closely woven, and fulled, with a combed nap, making it (at least in late Republican and early Imperial days) cumbrous, expensive, and (except in winter) too heavy. The shape of the toga, like its size, the elaboration of its folds, and the way it was worn, varied at different times. It was less voluminous in earlier days. By the beginning of the Empire it must have been fully twice as long as the wearer was tall, of elliptical shape, folded lengthwise, hanging over the left shoulder (with the fold towards the neck) so that the end rested a few inches upon the floor in front. The rest of the garment was passed around the back, under the right arm, and thrown backward over the left shoulder, so that the end hung down behind, but cleared the ground. The folds were most carefully and systematically arranged (later, pins or clasps were used), the end depending in front was raised to clear the floor, and the slack (*nodus*, *umbo*) allowed to hang down over the mass of folds (*sinus*) that crossed the front of the body towards the left shoulder. It gave place under the Empire, except on formal occasions, to lighter and more convenient garments, chiefly of foreign origin. Consult the article "Toga" in William Smith, *A Dictionary of Greek and Roman Antiquities*, vol. ii (3d ed., London, 1891); H. W. Johnston, *The Private Life of the Romans* (Chicago, 1903). See COSTUME.

TOGASASTI. See TAGOSATI.

TOGGLE JOINT (probably connected with ME. *toggen*, *tuggen*, to tug). A mechanical appliance acting on the principle of the inclined plane. Let *ad* and *ag* represent the arms of the toggle joint, with the joint at *a*. Then, if the arms are brought to a perpendicular, the end *d* being stationary, the point *a* will move through the arc *ab* to *b*, and at each point in the arc in the direction of a tangent at that point. As the point *a* approaches *b* the tangent will become more and more horizontal, and at last perpendicular to the arms *ad* and *ag*. When they form one and the same straight line the weight *w* will have been raised to twice the height *bc*. The form in the figure here presented is given to show more clearly the action of the knee and elbow joints in man, but that which is more frequently used, particularly in mechanical presses (to which the appliance is peculiarly adapted), makes the ends *d* and *g* of the arms approach each other, applying the power at *a* making *ac* the perpendicular. It will be seen that on the application of power the motion of the point *a* will at first be quite rapid (when the material to be pressed, such as hay or cotton, is loose), becoming slower and slower as the points *d* and *g* approach each other, so that when both arms become very nearly perpendicular the weight or resistance will move very slowly; but the power will be extremely great, and adapted to the resistance offered by the greatly compressed bale. See INCLINED PLANE.



TOGHRA, tŏ′grȧ. A term in Turkey for the cipher or signature of the Sultan reigning over the Ottoman Empire. This cipher, changing with every reign and with the name of the ruler, displays the Arabic characters which make up his name and title in a whorl-like form, which reads from right to left. It appears on the coinage of the realm, on postage stamps, the Imperial buildings, and in any place where a coat of arms would be displayed in a European monarchy.

The word *Toghra* is derived from the Turkish verb *toghramak*, to cleave, to cut, to mark, having in this respect a derivation not unlike that of the English phrase "to make his mark," used of signatures.

A legend, often quoted, represents the Toghra, whose convolutions are not unlike those on the thumb, as having been made by a sultan dipping his thumb in ink, which some ingenious calligrapher modified into a cipher of the royal name. But the date of this legend, which is associated with the illiterate Othman who founded the Ottoman dynasty, falls some two centuries later than the use of the word for the royal sign manual. Under a Seljuk sultan, Malik Shah, better known as Jalal din (1072–1104), a Persian poet, Abou Esmail Hosein (1063–1121), bore the title of Toghrayi. A contemporary speaks of him as the officer whose duty it was to write upon firmans and other instruments the Sultan's signature, which was accepted as written by the Sultan himself.

It is not uncommon for an Oriental ruler to affect an inability to write. The Emperor of China simply made his mark with a vermilion pencil. The Sultan of Morocco—often in cases where he, as with Mulai Hassen, was one of the best-educated men in the Empire—placed a scroll at the end of the documents he signed.

The Toghra was selected anew by each ruler and has analogies to the French paraph. It seems to be the case that the Turkish sultans originally made their mark. This was succeeded by an intricate calligraphic cipher, giving the name and title. In time this came to be accepted as signifying a ruler's assent, and, as the English Chancellor affixes the royal seal, so the Toghrayi performed the same office.

TOGO, tō′gō, or **TOGOLAND.** A territory in West Africa, bounded by Dahomey on the east, the Gulf of Guinea on the south, the Gold Coast Colony on the west, and the colony of Upper Senegal and Niger on the north (Map: Africa, E 4). Area, estimated at about 33,700 square miles. The low sandy coast rises towards the interior, which is mostly undulating and traversed by the Aposso Mountains, entering from northern Dahomey. The chief rivers are the Mono, the Dako, the Sio, and the Haho. There are many coast lagoons. The climate is moist and unhealthful. Togo possesses abundant natural resources. Extensive coconut plantations have been established along the coast, and good crops of corn and rice are raised. Tobacco and coffee are also cultivated. The chief products for export are palm kernels, palm oil, rubber, ivory, and copra. The imports and exports amounted in 1913 to 10,631,000 and 9,138,000 marks respectively. The chief ports are Lome, which is also the seat of administration, and Little Popo. There are 327 kilometers of railway: Lome-Anecho (Little Popo), 44 kilometers; Lome-Palime, 119 kilometers; Lome-Atakpame, 164 kilometers. The native population is estimated at 1,032,000; white population, Jan. 1, 1913, 368, of whom 320 were German. Togoland was declared a German protectorate in 1884. On Aug. 7, 1914, it was seized by British and French forces. See WAR IN EUROPE.

TOGO, HEIHACHIRO, COUNT (1847–). A Japanese admiral, born in Kagoshima, of a Samurai family. He entered the navy in 1863, fought in the Civil War of 1868, and afterward received training on the British ship *Worcester*, and at the Naval College, Greenwich. As captain of the cruiser *Naniwa* in 1894 he precipitated the war with China by firing upon and sinking the Chinese transport *Kowshing*. At the end of the war he was made rear admiral, and in 1900 became vice admiral with his station at Maizuru. As commander in chief of the combined Japanese fleet he delivered the first great blow of the Russo-Japanese War by his torpedo attack on the enemy's fleet at Port Arthur on the night of Feb. 8–9, 1904. For his career in the war, see Russo-Japanese War. In 1912 he was admiral of the fleet, and he also held the post of chief of the naval general staff. Togo was honored with the British Order of Merit.

TOGUE, tōg. See Namaycush.

TOILERS OF THE SEA. See Travailleurs de la Mer.

TOKAIDO, tô-kī′dô. An ancient division of Hondo, the principal island of Japan, occupying the eastern part of the island. It developed later than the western and southern parts of the island, but since the triumph of Yoritomo (q.v.) at the end of the twelfth century it has been dominant, ruling Japan from Kamakura and Yedo (Tokyo). It is now the most populous and richest part of Japan.

TOKAIDO. A name applied to the great highway which connects Tokyo with Kyoto. It is 323 miles long. Starting from Nihombashi (Jap., Bridge of Japan) in Tokyo, it skirts the Bay of Tokyo and the Pacific, climbs the Hakone Mountains across the peninsula of Idzu, again follows the coast line through many large towns to Kuwana, 247½ miles from Nihombashi, where it turns inland to Lake Biwa and Kyoto. Here in the days of the Tokugawa régime the daimyos from the centre and west of Japan traveled with their trains of armed men to and from their enforced residence in Yedo. The sides of the road were planted with lines of great cedars. By the completion of the railway between the cities its importance has diminished.

TO′KAJ (*Ger. pron.* tŏ′koi), **TOKAY**, tŏ′kī. A town in the County of Zemplin, Hungary, at the confluence of the Bodrog and Theiss, 41 miles north of Debreczin (Map: Hungary, G 2). In the vicinity are sapphire and carnelian deposits and salt works. Tokaj is celebrated for its wines from vineyards 138 square miles in extent, producing over five million gallons annually. Pop. (town), 1910, 5321, mostly Magyars.

TOKAT, tô-kät′ (Arm. *Evtoghia*). The capital of a sanjak in the Vilayet of Sivas, Turkey in Asia, 125 miles northeast of Kaisarieh (Map: Turkey in Asia, C 2). It is in a hilly region, abounding in fine scenery, and is well laid out. The chief features of interest are the Byzantine castle and the old Roman tombs. The town is the commercial centre for a section producing fruit, hemp, corn, and tobacco, and has manufactures of cotton cloth, dyestuffs, copper wares, and leather. A number of copper smelters are operated in the suburbs of the town. Pop., about 30,000, the majority being Mohammedans. During the Middle Ages Tokat, the ancient Dazimon, was an important trading centre. It was the scene of an Armenian massacre in 1895.

TOKEN MONEY. See Money.

TOKIO. See Tokyo.

TOKOL′OGY. See Obstetrics.

TÖKÖLYI, tẽ′kẽl-yī, or **TÖKÖLI**, Imre (Emerich), Count (1656–1705). An Hungarian patriot. He belonged to a Lutheran family and was born at the Castle of Késmárk, in the County of Zips. His father, Count Stephen, was implicated in the conspiracy of Zrinyi, Rákóczy, and Frangipani against Leopold I of Austria; and after his death, and the execution of Zrinyi and others, young Tökölyi sought an asylum in Poland, where he had large possessions. After vain endeavors to recover from the Emperor his patrimonial estates he obtained the support of Apafi, Prince of Transylvania, and in 1678 he took the lead in the insurrection in Hungary. He captured a number of towns, and even penetrated into the heart of Moravia. The Turkish Sultan, Mohammed IV, espoused his cause, and in 1682 declared him Prince of Hungary under Turkish suzerainty. Tökölyi joined Kara Mustapha in the great onslaught on Austria in 1683, but after the disaster to the Turks at Vienna many of his followers fell off from him, and in 1685 he was imprisoned by the Turks. He was soon released and unsuccessfully resumed operations. In 1689 he was made Prince of Transylvania by the Sultan, and invaded that country with a Turkish army, but was forced back into Wallachia. He took part in the subsequent campaigns against Austria, and after the Peace of Karlowitz he was made by the Sultan Prince of Widdin and resided as his pensioner at Constantinople, where he died.

TOKUGAWA, tŏ′kōō-gä′wȧ. The name of the great family which ruled Japan for more than two centuries and a half (1600–1868). Its founder was Ieyasu, one of the five generals from the east of Japan who restored peace after centuries of feudal strife and anarchy. He claimed descent from an early Emperor through the Minamoto family, and took their hereditary title "shogun" (general) (q.v.). He made Yedo, or Tokyo, then an obscure village, the capital of Japan, reformed the laws, and established the system which was characteristic of Japan and made it unique in the eyes of foreigners. Ieyasu retired in 1604 to Shidzuoka, but continued to rule through his son until his death in 1616. His descendants were shoguns to the number of fourteen. The greatest of them was Iemitsu, his grandson, who ruled from 1623 to 1649. Most of the Tokugawa shoguns were weaklings and debauchees. The fifteenth shogun resigned his powers to the Emperor in 1868 and retired to Shidzuoka. Since that time the family has exerted no political power.

TOKUSHIMA, tŏ′kōō-shē′mȧ. The capital of the Prefecture of Tokushima, in Japan, near the coast in the northeastern part of the island of Shikoku (Map: Japan, D 6). It is the largest city on the island, and is beautifully situated. Pop., 1908, 65,561.

TOKYO, tŏ′kê-ō, or **TOKIO** (formerly Yedo) (Jap., Eastern Capital). The capital of Japan, situated on the southeast side of the main island, Honshiu, or Hondo, on the Bay of Tokyo (Map: Japan, F 6). Tokyo is the largest city of Japan and succeeded Kyoto as the capital upon the Imperial restoration in 1868. The city covers about 30 square miles, and is exceedingly irregular in outline, being, indeed, a number of towns grown together rather than a single city laid out according to design. It is divided into two unequal parts by the river Sumida. The eastern portions along the river and fronting the bay are level and low, the western rise into considerable hills with a dense population in the valleys which separate them. The chief feature is the palace inclosure within the grounds of the ancient castle. These grounds under the old régime were very extensive and were surrounded by an outer wall and moat more than two and a half miles in length. This wall has been leveled in part and the moat filled up. Within was a second moat and wall, and even a third in parts. The old residence of the shogun within the third wall was burned in 1872 and has been replaced by the palace of the Emperor, in a mixed Japanese-European style of architecture. It stands in the ancient and beautiful park called Fukiage. The palace was first occupied by the Emperor in 1889. Much of the area inclosed by the outer wall and moat was occupied in the past by the mansions of the feudal barons, but these are now destroyed and in their place are the various buildings devoted to the use of the government, in European style and devoid of especial interest. To the east of the castle is the distinctively commercial portion of the city, with banks, warehouses, shops, hotels, restaurants, newspaper offices, and dwellings. A long main street, variously named in different parts and without any general designation, passes through this part of the city from northeast to southwest. It is broad, with rows of trees, a tramway, electric lights, and rows of low buildings of stone and brick in a semi-European style. From it lanes and streets diverge in all directions, for the greater part lined with small wooden buildings, inexpensive and without pretension. Mingled with them are storehouses made of mud or clay, and incongruous modern buildings. Of late years some of the streets have been straightened and widened, wooden bridges have been replaced by iron ones, and many improvements have been introduced. Nevertheless the old styles of shops and dwellings are in so vast a majority that this part of Tokyo is still essentially as in the centuries past.

In the northern part of the city is the arsenal, with the beautiful garden attached which formerly belonged to the mansion of the barons of Mito. Not far away is the ancient building used as a library which was once the great Confucian College. Farther to the north on the site of the town mansion of the Baron of Kaga is the Imperial University. (See Tokyo, University of.) Farther to the east is the great park, Ueno, with the mortuary shrines of eight of the shoguns of the Tokugawa family, and the Imperial Museum filled with objects of great interest. Still farther to the east is the great temple of the goddess of mercy, Kwannon Sama, with a park, many shrines, a pagoda, rows of shops, and innumerable places of amusement. Across the river Sumida the eastern portion of the city embraces the two districts called Honjo and Fukiage, a quiet region known to visitors chiefly for its displays of flowers, the cherry blossoms at Mukojima, the wistaria at Kameido, and the iris at Horikiri, and for the great wrestling matches at the temple E-ko-in. On the west bank of the Sumida was the Foreign Concession, but since the abolition of extraterritoriality foreigners are permitted to live in all parts of the city. In the same district, on the shore of the bay, is the Imperial park known as Enryo-kwan. In the southern part of the city is the park called Shiba, with the magnificent mortuary shrine of the second shogun, and the almost equally fine shrines of six others. Beyond the park, still following the line of the bay, is the Temple of Sankakuji, famous for the little cemetery containing the tombs of the 47 Ronins. To the west of the palace are many large residences surrounded by gardens and high walls. In the suburbs there are many delightful resorts, especially Meguro, Oji, Futago, and Ikegami. The city is protected against fire by a well-organized fire department. It has also an excellent police system. The affairs of the city are administered by a mayor, a municipal council, and a municipal assembly. Tokyo has few industrial interests, although there are numerous factories in the neighborhood. It is unfavorably situated for commerce. Trade is carried on by way of Yokohama. Pop., 1898, 1,440,121; 1908 (city), 2,186,079; 1912, 2,099,000.

Originally an obscure hamlet called Yedo (gate of the inlet) stood on the seashore in the district of the city now called Asakusa, while most of the busiest parts of the present city were covered with the waters of the bay and of lagoons. Near Yedo a rude castle was built in the fifteenth century, but the place continued without importance until towards the end of the sixteenth century, Tokugawa Ieyasu took possession of it, and in 1603 made it the seat of his government of the Empire. He retained the ancient name Yedo, but made it speedily the most important city in Japan.

The records of the city contain accounts of many terrible catastrophes. It was repeatedly destroyed in conflagrations, until in recent times the building of rows of brick and stone houses has furnished efficient barriers. It has also suffered greatly from earthquakes and from epidemics, while terrible storms have destroyed thousands of dwellings. After the weakening of the house of Tokugawa, in 1863, the requirement of residence for the barons was relaxed, and the population fell off greatly. But after the fall of the shogunate on Sept. 13, 1868, it was made the eastern capital, and its name was changed accordingly to Tokyo. It was opened to the residence of foreigners in 1869. Though nominally only the eastern capital, yet, as the residence of the Emperor, the meeting place of the Diet, and the seat of the government in all departments, it is in reality the only capital of the Empire, Kyoto retaining an empty title merely.

TOKYO, University of. A Japanese university founded in 1868 by the union of two older schools, as one of the results of the great political and social revolution of that year. It has grown with the growth of modern Japan. At first officered largely by foreigners, these have been gradually superseded by Japanese, for the most part trained in Europe and the United States. The university is a government institution. Its administration is vested in a president and a board of councilors, two from each college, named by the Minister of Education, for a term of five years. The colleges comprise law, medicine, engineering, literature, science, and agriculture. Two degrees are given, one for work in course, the other for special distinction. The university includes an observatory and a library. There were 5354 students in 1912–13, nearly half the number being in the college of law. The library in 1912 contained 491,082 volumes, of which 267,718 are in Japanese and Chinese, and 223,364 in foreign languages, and some 100,000 pamphlets. Consult C. F. Thwing, *Universities of the World* (New York, 1911).

TOLA, tō′lȧ. See Kermes.

TOLA. See India, *Weights and Measures.*

TO′LAND, John (1670–1722). A deistical writer. He was born near the village of Redcastle, in the County of Londonderry, Ireland. He was brought up as a Roman Catholic, but in his sixteenth year was a Protestant. He entered the University of Glasgow in 1687, but removed to that of Edinburgh, where he took the degree of master of arts in 1690. Thence he passed to Leyden, where he entered upon theological studies. On his return to England he resided for some time at Oxford, where he was already looked upon as a free-thinker. *Christianity not Mysterious*, which he published in London in 1696, and in which he fully avowed his principles, created a sensation in the theological world. In the following year Toland returned to Ireland, but his book was burned publicly by order of the Irish Parliament. Finding it necessary to flee from Ireland, Toland returned to London, where he published a defense against this judgment of the Irish Parliament; but he soon afterward turned his pen from theological to political and literary subjects. His *Life of Milton* (1698) was attacked as containing heresy, and he defended himself in *Amyntor* (1699). A pamphlet entitled *Anglia Libera* (1701), on the succession of the house of Brunswick, led to his being received with favor by the Princess Sophia at the court of Hanover, and to his being sent on a kind of political mission to some of the German courts. In 1705 he openly avowed himself a pantheist. In this course he was emboldened by the patronage of Harley, by whom he was sent abroad to Holland and Germany in 1707. He returned to England in 1710; and having forfeited the favor of his patron, or at least having separated from him (1714), he engaged as a partisan pamphleteer on the side of Harley's adversaries. During this period he published *Nazarenus* (1718) and *Pantheisticon* (1720). His later life was spent in obscurity and poverty. Consult Leslie Stephen, *History of English Thought in the Eighteenth Century* (3d ed., 2 vols., New York, 1902).

TOLBOOTH, tŏl'bōōTH' *or* -bōōth'. A massive structure, dating from various periods, on Castle Hill, Edinburgh, removed in 1817. It served as a Parliament House, a court, and a prison. It figures in Scott's *Heart of Midlothian*.

TOLDY, tŏl'dĭ, FERENCZ (1805–75). An Hungarian literary historian. His real name was Schedel. He was born in Ofen, and was educated at Budapest as a physician. In 1830 he founded with Paul Bugát, at Budapest, the *Orvosi Tár*, the first Hungarian medical journal, and from 1833 to 1844 he was assistant professor of dietetics at the university. From 1835 to 1861 he was secretary of the Hungarian Academy, and in 1836 he founded the great Kisfaludy literary society, of which he became president in 1841. After 1849 he devoted himself entirely to the history of Hungarian literature, and in 1861 was appointed professor of that subject in the university. His works in German and Hungarian include: *Handbuch der ungarischen Poesie* (2 vols., 1828); *Kulturzustände der Ungarn vor der Annahme des Christentums* (1850); *A magyar nemzeti irodalom története* (History of the Hungarian National Literature, 3 vols., Budapest, 1851–53); *A magyar költészet története* (History of Hungarian Poetry, 1855; 3d ed., 1875); *Marci chronica de gestis Hungarorum* (1867); and *A magyar költészet kézikönyve* (Handbook of Hungarian Poetry, 2 vols., 1857; 2d ed., 5 vols., 1872). Consult the eulogies of Toldy by Greguss and Szasz in the *Annals* of the Kisfaludy Society (new series, xi), as well as the notice by P. Gyulai in the *Annals* of the Academy (1876).

TOLE'DAN RITE. See MOZARABIC LITURGY.

TOLEDO, tō-lē'dō; *Sp. pron.*, tō-lā'THō. The capital of the Province of Toledo, Spain, 42 miles south-southwest of Madrid, on the Tagus (Map: Spain, C 3). The hundred-towered city, situated on a bold promontory, bordered on three sides by a bend of the Tagus and surrounded by a lofty wall, preserves almost unchanged its mediæval appearance. The Tagus is spanned by the bridge of San Martín, a well-constructed specimen of the military architecture of the Middle Ages, and the thirteenth-century bridge of Alcántara; the walls are pierced by a number of gates, of which the most beautiful is the Arabic Puerta del Sol. The houses of the city cluster in the form of a semicircle around the Alcázar. The streets are winding, narrow, and steep. Among the many interesting churches are the Gothic cathedral dating from 1227, with its forty chapels and library of ancient manuscripts; the cloister of San Juan de los Reyes, a gift of the Roman Catholic sovereigns; Santa María la Blanca, first a mosque, then a Jewish synagogue of the twelfth century, and now after many vicissitudes a church; and El Tránsito, another synagogue dating from 1366, and given by the Roman Catholic sovereigns to the Knights of Calatrava. Many former convents are devoted to the services of the state as prisons and hospitals. The city hall with two towers and classic façade dates from the fifteenth century. There are a beautiful theatre, and a provincial library containing 70,000 volumes, housed in the archbishop's palace. Toledo is the seat of an archbishop who bears the title of primate of all the Spains—one of the few survivals of the period when the city was the centre of Spanish national life. It is largely untouched by modern industrial life and exists as a survival of the golden age of Spanish chivalry. The climate is rather unhealthful and the surrounding region largely barren and cheerless. The city has manufactures of spirits, beer, chocolate, varnish, church ornaments, cloth, silk goods, pottery, brick, and fans. But the most famous establishments of Toledo are those devoted to the manufacture of arms, for even before the time of Roman domination Toledo blades were famous. The present government factory dates from 1777; within recent years establishments for the manufacture of cartridges have been added. There are also several private establishments for the manufacture of arms and ammunition. Pop., 1900, 20,201; 1910, 22,274.

Nothing certain is known of the origin of Toledo. Under the name of Toletum it is mentioned by Livy in connection with the date 192 B.C. After the period of Roman sway it fell first into the power of the Alani, and a little later came under the control of the Visigoths, of whose kingdom it became the capital. From 400 to 701 A.D. it was the meeting place of eighteen Church councils which exercised a great political as well as religious influence on Spain. Under the Arabs it was a city of great importance. After the dissolution of the Caliphate of Cordova it was the seat of a short-lived Mohammedan kingdom. Alfonso the Valiant of León and Castile conquered this state in 1085 and gave the name of New Castile to the region. The town became an important place of residence for the Castilian monarchs. In the War of the Communes (1520–21) Toledo espoused the popular cause. In 1808 it took part in the national uprising against the French, and in 1810 and 1813 suffered much from the vandalism of their armies. Consult Hannah Lynch, *Toledo*, in the "Mediæval Towns Series" (New York, 1899); A. F. Calvert, *Toledo: An Historical and Descriptive Account* (ib., 1907).

TOLEDO. A town of Cebú, Philippines, situated on the central part of the west coast, 39 miles from Cebú. Petroleum and natural gas are found in the region. Pop., 1903, 12,929.

TOLEDO, tō-lē′dō. The county seat of Lucas County, the fourth largest city in Ohio, on the Maumee River at its entrance into Maumee Bay, 9 miles from Lake Erie (Map: Ohio, D 2). The city covers 30 square miles; its northern boundary extends to within 2 miles of the Michigan State line. It is the terminus of a number of railroads, among which are the Pennsylvania, the Hocking Valley, the Clover Leaf, the Pere Marquette, and the Grand Trunk. In all there are 17 railroads operating 22 divisions, 12 electric interurban, and five passenger steamship lines connecting with Detroit, Mackinaw, Duluth, and Chicago.

Situated at the west end of Lake Erie and at the foot of the upper chain of the Great Lakes, Toledo is the natural receiving point of the ore traffic from the Lake Superior region, and of grain and lumber from the Northwest. Likewise it is the natural distributing point for Ohio and Virginia coal to the north and northwest. Its harbor is one of the finest on the Great Lakes. The government channel is 400 feet wide and 21 feet deep through the bay, and from 700 to 1400 feet wide to the dock farthest up the river. Of the 35 miles of river front, 15 are lined with docks. In 1915, 4500 freighters loaded and unloaded in the harbor. Federal statistics for 1915 show that 7,114,483 bushels of grain and 46,318,804 tons of ore were received in Toledo. The city's export of soft coal in 1915 exceeded 4,000,000 tons.

Industrially Toledo is second to Cleveland among Ohio cities. In 1915 there were 2000 establishments employing about 40,000 people. The most important industry is the manufacture of automobiles, one plant alone employing 15,000 persons. There is also a large bottle manufactory with an annual output of 1,300,000,000 bottles. Other important products include plate glass, wagons, malleable castings, elevators, springs, baby carriages, scales, atomizers, wheelbarrows, electrical apparatus, linseed and castor oils, pig iron, coffee, flour, sugar, and women's clothing. The city has 420 miles of streets, 230 of which are paved, 116 miles of electric street railway, 312 miles of water mains, and 262 miles of sewers. There are 12 large parks and 41 triangular parks, covering 1024 acres. A 25-mile boulevard connects the parks and surrounds the city.

Toledo's prominent buildings include an art museum of white marble, Scott and Wait high schools, a new post office, a courthouse, Second National Bank, Newsboys' Building, the Toledo Club, St. Francis de Sales School and Chapel, State Hospital for the Insane, and the Cherry Street Bridge. The public-school system includes two high schools and 43 elementary schools. The teaching corps numbers 900. Toledo is one of the five cities maintaining a municipal university. The university had, in 1915, 36 instructors, and 150 full-time and 700 part-time students. There are 16 parochial schools, the Ursuline and Notre Dame academies, and St. John's College, maintained by the Roman Catholic church. The public library contains 100,000 volumes. There are 110 Protestant and 23 Roman Catholic churches.

A charter which went into effect on Jan. 1, 1916, makes the mayor, vice mayor, and council the only officers elected by the people and subject to the recall. The heads of all departments and all boards are appointed by the mayor, to whom they are directly responsible. They include a director of law, finance, public service, public safety, public welfare, and public utilities. The mayor also appoints the university trustees, and the civil service, city plan, and public efficiency commissions. The city's annual expenditure for maintenance approximates $2,000,000, the bonded debt interest about $397,000. The water works are municipally owned. The water is taken from the Maumee River, and passes through several filtrations.

Toledo is the outgrowth of two sparsely settled townships, Port Lawrence in 1817, and Vistula in 1832. Originally it was the hunting grounds of the Indians, and later the theatre of important historical incidents in connection with the Indian War, conducted in the region of northwestern Ohio by Mad Anthony Wayne. Near the original site was fought the battle of Fallen Timbers which ended all savage warfare in the Northwest. The city was named in 1835 after the old Moorish capital in Spain. The village was incorporated in 1836. With the opening of the Wabash and Erie canal in 1843 and the Miami and Erie canal in 1845, the town developed rapidly. Pop., 1900, 131,822; 1910, 168,497; 1915, 205,000 (exclusive of West Toledo, Rossford, and other outlying districts). Consult Harvey Scribner, ed., *Memoirs of Lucas County and the City of Toledo, from the Earliest Historical Times down to the Present* (2 vols., Madison, Wis., 1910).

TOLEDO WAR. A boundary controversy which arose in 1835 between the State of Ohio and the Territory of Michigan. Congress in the Ordinance of 1787 had reserved the right to form new States out of that part of the territory northwest of the Ohio River lying north of an east and west line drawn through the southerly bend or extreme of Lake Michigan. At this time the southern extreme of Lake Michigan was unknown, and was supposed to be much farther north than it actually was. Ohio was admitted as a State in 1803, the above line being described in the act as its northern boundary, though the State constitution claimed more territory. When in 1805 Michigan Territory was organized, and, later, Indiana and Illinois became States, the most confused ideas existed on the boundary question. A survey was made by order of Congress in 1817 which established the present line. The old line had included in Michigan the city of Toledo, and this was the main point in dispute. In 1835 Ohio laid claim to all within the new line, known as the Harris line, and proceeded to organize townships therein. Michigan declared the intention of resisting such invasion, and the militia of both sides were called upon to maintain the alleged rights of their respective governments. An opinion of the United States Attorney-General B. F. Butler (q.v.) (1795–1858), favored Michigan; President Jackson sent out a peace commission with no result, and serious conflict seemed imminent. In September, 1835, the Michigan troops occupied Toledo to prevent the formal organization of Wood County by Ohio officers. The latter, however, accomplished their purpose secretly and withdrew. The trouble was finally settled by the admission of Michigan into the Union on condition that she accept the Harris line, while as a makeweight that State was given the upper Wisconsin Peninsula, which afterward proved from its mineral wealth to be far more valuable than the disputed territory.

TOLENTINO, tō̆′lĕn-tē̆′nô. A town in the Province of Macerata, Italy, on the Chienti, 30 miles south-southwest of Ancona (Map: Italy, D 3). The cathedral has a good portal by Rosso. The churches of San Catervo and San Francesco possess noteworthy frescoes and reliefs. There are manufactures of machinery, silks, woolens, wine, and olive oil, and stone quarries. Tolentino was the scene of Murat's defeat by the Austrians on May 2–3, 1815. Pop. (commune), 1901, 12,872; 1911, 14,254.

TOL′ERA′TION (Lat. *toleratio*, from *tolerare*, to endure, tolerate; connected with Gk. *τλῆναι*, *tlēnai*, to bear, endure, Skt. *tul*, to lift up, weigh). The recognition of the right of private judgment; specifically, such recognition, on the part of the government, in matters of faith and worship. By governmental toleration is granted not only the liberty of holding and putting into practice varied religious opinions, but of teaching and defending them publicly. But thereby no permission is given to violate the rights of others, or to infringe laws designed for the security of the governing power or for the protection of decency, morality, or good order. See Liberty, Religious.

TOLIMA, tô-lē̆′mȧ. A department of south Colombia, South America (Map: Colombia, B 3). Area, about 10,080 square miles. It lies between the Central Cordillera and the Magdalena River. Agriculture is carried on chiefly in the central part, where coffee, sugar, cacao, rice, and tobacco form the chief products. Stock raising is important. The mineral deposits include gold, silver, copper, lead, and sulphur. The climate along the river is tropical, but it is cold in the upper mountain regions. There are no good means of communication. Pop., 282,426. Capital, Ibagué (q.v.).

TOLIMA. A quiescent volcano in Colombia rising from the Central Cordillera of the Andes, 75 miles west of Bogotá. It is the highest peak in the country, having an altitude of 18,325 feet.

TOLL (AS. *toll*, *tol*, OHG. *zol*, Ger. *Zoll*, toll, tax; probably from Lat. *telonium*, from Gk. *τελώνιον*, customhouse). In law, a charge or duty paid for some service, or the license to use something, generally in the nature of a public franchise. The right to exact toll is almost entirely created by statute, and generally is only granted to persons who maintain some public convenience, as a ferry, bridge, or turnpike. The setting forth of facts which establish a bar to the maintenance of an action by reason of lapse of time is sometimes described as a toll of the Statute of Limitations. See Ferry; Franchise; Highway.

TOLL, tôl, Eduard, Baron von (c.1850–1902). A Russian scientist and explorer. He began arctic research with Bunge (1885–87), investigating the Post-Tertiary fauna of the Jana and adjacent regions. In an expedition to the New Siberian Islands (1893) he found the body of a mammoth in the Jana delta. He commanded the *Sarja* expedition, which wintered (1901–02) on the west coast of Kotelnoi Island. The explorations of F. G. Seeberg and Von Toll disclosed extensive Post-Tertiary fauna on this island. Many specimens, mammoths, reindeer, etc., were superimposed on enormous ice cliffs, 70 feet thick in places, remnants of the Ice age. The two explorers started south in November, 1902, and perished en route. Their records were found the next year by Kolchek on Bennett Island. Consult Emma Toll, *Die Russische Polarfahrt der Sarja* (Berlin, 1909).

TOLL, tôl, Johan Christopher, Count (1743–1817). A Swedish statesman and soldier, born at Mölleröd in Skåne. He participated in the coup d'état of Gustavus III in 1772, after which he played an important part in the government, especially as the efficient head of the War Department. In the war with Russia (1788), begun against his advice, he was unjustly accused of neglect of the country's defense. Under Gustavus IV also he was active as a public officer and diplomat and for many years was Governor-General of Skåne.

TOLLENDAL, Baron de. See Lally, T. A.

TOLLENS, tôl′ens, Bernhard (1841–). A German agricultural chemist. Born at Hamburg, he received his doctorate in philosophy at Göttingen in 1864, became an assistant at Heidelberg in 1865, and studied at Paris (1868) and at Coimbra (1869). Returning to Göttingen in 1870, he was professor and director of the university agricultural-chemical laboratory from 1873 until his retirement in 1911. He was editor of the *Journal für Landwirtschaft* and author of *Kurzes Handbuch der Kohlenhydrates* (1888; 3d ed., rev., 1914).

TOLLENS, tôl′lĕns, Hendrik Caroluszoon (1780–1856). A Dutch poet, born in Rotterdam. He was the son of a merchant and himself was engaged in commerce till 1846. His early work followed French models and ideas. His first original works were poems (1802), followed by *Lucretia* (1805) and other historical tragedies and works of much strength. His subsequent productions were mainly lyric and more distinctively national and simple. These poems, gathered under various titles (1808–53), show powers undiminished to the last. He won wide popularity through the national song *Wien Neerlandsch bloed.* His best work is *Tafereel van de overwintering op Nowa Zembla* (Picture of the Wintering on Nova Zembla, 1819). A complete edition of his works appeared in 12 volumes (Leeuwarden, 1855–57). Consult Schotel, *Tollens en zijn tijd* (Tiel, 1860).

TOLL ROADS. See Highway; Road.

TOLOSA, tô-lō̆′sȧ. The former capital of the Province of Guipúzcoa, Spain, 16 miles southwest of San Sebastián, in the valley of the Oria and on the Irun-Burgos line of the Northern Railway (Map: Spain, E 1). It contains the church of Santa María, the Palacio Idiaquez, and two handsome paseos. During the nineteenth century it was an important Carlist centre. Its principal manufactures are paper, woolens, steel, brassware, and malt liquors. Pop., 1900, 8100; 1910, 9747.

TOLSTOY, Alexander Ivanovitch Ostermann. See Ostermann-Tolstoy, A. I.

TOLS′TOY, *Russ. pron.* tôl-stoi′, Alexei Konstantinovitch, Count (1817–75). A Russian author. He was born in St. Petersburg and studied at Moscow. After seeing diplomatic service and traveling extensively, he took part in the Crimean War and subsequently held a high position at the court. He wrote lyric and epic poetry and one novel, *Prince Serebriany* (trans. by J. Curtin, 1893), after the manner of Sir Walter Scott. His chief literary achievement, however, was his dramatic trilogy, *The Death of Ivan the Terrible* (1866; Eng. trans. by F. Harrison, London, 1869), *Czar Fiodor Ivanovitch* (1868), and *Czar Boris* (1870).

TOLSTOY, Dmitri, Count (1823–89). A Russian statesman. After serving in the ministry of the navy, he became procurator of the Holy Synod in 1865 and Minister of Public Instruction in 1866. His preference for the classical languages in the intermediate schools and his petty tutelage over the universities brought him such widespread enmity that he was obliged to resign his education post in 1880. He was appointed president of the Academy of Sciences in 1882 and served as Minister of the Interior in 1883–85. He was the author of a history of the finances of Russia to the reign of Catharine II (1847) and of *Le catholicisme romain en Russie* (1863–64).

TOLSTOY, Liov, (Leo) Nikolaievitch, Count (1828–1910). A famous Russian author and one of the world's greatest novelists. He was born on his father's estate at Yasnaya Polyana in the Government of Tula, Aug. 28, 1828. In 1843 he studied Oriental languages at the University of Kazan, but soon found linguistic study uncongenial and took up law. He received his diploma in 1848, "knowing literally nothing," as he declared later. He lived on his estate until 1851, when his brother, an artillery officer, induced him to visit Caucasia. Charmed by the life there, he joined an artillery regiment and in 1853 was attached to the army of the Danube during the Crimean campaign. During this period he published *Childhood* (his maiden work), *The Incursion*, *Boyhood*, *The Morning of a Landed Proprietor*, and *The Cossacks*. He took part in the defense of Sebastopol, embodying his experiences in *Sebastopol in December of 1854*, *Sebastopol in May of 1855*, and *Sebastopol in August of 1855*. These sketches immediately placed Tolstoy among the great writers of the day. They painted the horrors of war, with its false and real heroes, in the spirit of that cruel, cold-blooded realism which is the chief trait of Tolstoy's unique art. At the end of that war Tolstoy resigned and went to the capital. A visit abroad in 1857 shattered his faith in modern civilization, and *From the Memoirs of Prince Nekhlyudov* was an indignant protest against the poverty and ignorance in modern society. He settled on his estate at Yasnaya Polyana and devoted himself to teaching peasant children. Finding himself deficient in educational knowledge, he went abroad (for the second time) to study German methods of education, which, however, served only to intensify his doubts and disappointment. He questioned the right and wisdom of all compulsory education and maintained that the pupil's interest must alone determine the curriculum. About this time work on *The Decembrists*, a long novel, of which only three chapters appeared, led Tolstoy to the study of the reign of Alexander I, and his interest gradually centred on the great Napoleonic campaign. Thus he came to write his *War and Peace* (1864–69), a colossal prose epic, reflecting the whole range of Russian life at the beginning of the nineteenth century.

Again the elemental forces of the common people in contrast to the artificiality of the upper classes are lovingly dwelt upon. With the artistic exposition is intertwined a new philosophy of history, which in the last analysis is but old fatalism in a new guise. After this the above-mentioned pedagogical pursuits absorbed Tolstoy's energies until in 1875–76 *Anna Karenina* appeared in the *Russian Herald*. This great work deals with the unlawful relations of the social lion, Vronsky, and Anna, wife of Karenin, the bureaucratic official. The great questions of human life which centre about marriage are here treated with inimitable mastery, force, and naturalness. The novel has a second plot—the life of the rationalist landed proprietor, Konstantin Levin, and his wife, Kitty. Amid perfect home surroundings Levin is discontented and even contemplates suicide, until he is "regenerated" through contact with the common people and finds new strength in manual labor. According to Tolstoy's own statements this work contained much autobiographical material.

After this philosophical and social questions took complete possession of Tolstoy, and for more than a decade he gave to the world a series of religious, social, and philosophical treatises, such as *Commentary on the Gospel; Letter on the Census* (1883); *Confession: My Religion; What Shall we then Do?* a few short stories written for the people; *The Death of Ivan Ilyitch* (1885); and the dramas *The Power of Darkness* and *Fruits of Culture*. Works of literary art were also produced at this period. *The Kreutzer Sonata* (q.v.), its intent misunderstood, raised a storm of indignation on both sides of the Atlantic. *What is Art?* (1898), a great philippic against art as commonly understood, was a brilliant contribution to the literature of the subject, although its author left the question raised by the title unanswered for many of his readers. It contains ideas of great depth and breadth, interspersed with paradoxes, and affords an interesting illustration of the thoroughness with which Tolstoy entered upon his work. It involved a minute study of every writer of any consequence on the subject. In 1899 *Resurrection*, a new work of fiction, appeared. Its central figure, Nekhlyudov, while acting as a juror, recognizes in the culprit the woman whom he had betrayed in his youth. Torn by remorse, he finally comes to the conclusion that he is the real cause of the woman's guilt and downfall and wishes to expiate his former wrongdoing by accompanying her to Siberia and sharing with her all the hardships of exile. All the bitterness that had welled up in the heart of the author seems to have found free utterance in this work, which is a powerful arraignment of all existing institutions. In 1900 his drama, *The Living Corpse*, appeared. In March, 1901, the Holy Synod issued the excommunication which had been hanging over his head for 30 years.

In 1862 Tolstoy married Sophie Andreévna Behrs, of Moscow. One of his sons, Liov Liovitch, who inherited literary inclinations, attracted attention by his sketches in periodical publications. Another son, Ilya, wrote *Reminiscences* of his father. In 1910, in pursuance of a long-delayed plan to end his days in solitude, Tolstoy suddenly fled his estate, but contracted pneumonia on his journey and died, Nov. 20, 1910, at a small railroad station (Astapovo).

Tolstoy has the same power of psychological analysis that characterizes Dostoyevsky (q.v.), whom he greatly excels, however, in range and variety. Dostoyevsky never gets beyond the narrow circle of the middle classes, while Tolstoy is equally at home in all walks of life. He draws, with the same firm and unerring hand, the rulers of men's fates, courtiers, generals, petty officers, common soldiers, great noblemen, peasants, prisoners in the dungeons and on their weary march to Siberia, men, women, children, and everywhere he fathoms the depths of human character. There is in Tolstoy none of Dostoyevsky's nerve harassing for the sake of satisfying the author's abnormal bent. The great reformer is actuated by nothing but the desire to get at truth, and his conscience can never rest until he succeeds. Hence Tolstoy's works, although depicting the genesis and growth of controlling passions in a masterly manner and containing scenes that are fascinating, possess none of those elements of piquancy that attract many to the works of the realistic school.

Coming to know his peasants through his pedagogical work among them, he became a great believer in the salutary influence of labor. His community work during the famines of 1873 and 1891 gave him an impulse for the simplification of life, and soon the foreign periodicals were filled with sensational pictures and descriptions of Tolstoy in a cheap blouse or smock, girded with a rope, with his hands on a plow, tilling his estate at Yasnaya Polyana. Gradually he dispensed with all unnecessary comforts of life and did cobbling and other manual labor for himself, preaching *Karma* (q.v.) and the doctrines of Lao-tse. (See TAOISM.) The principle of simplification was carried into his religious beliefs: all teaching not coming from Christ himself was ruthlessly discarded, and his gospel was newly constructed. The doctrine of Christian humility was carried to an extreme in his famous championship of nonresistance, especially remarkable side by side with individualism of an extreme kind. All human institutions—kingly power, state, church, judiciary, jury, army, even marriage—were ruthlessly criticized as standing in the way of the natural development of the powers of the individual. Always allowing his logic to lead him as it would, Tolstoy had to denounce his own literary achievements along with all products of civilization, as begotten of idle fancy and human craving for the plaudits of the world. In 1905 and 1906 he addressed to the Czar notable letters advocating universal suffrage, representative assemblies, and other reforms.

Bibliography. Tolstoy's works have been repeatedly collected and published in translations as well as in the original. Biryukov's (24 vols., Moscow, 1913) is the most authoritative complete Russian edition. Collected translations in English have been made by N. H. Dole, I. Hapgood, and others (22 vols., New York, 1902) and Leo Wiener (24 vols., Boston, 1904–05). A complete translation of Tolstoy's plays, including the posthumous works, has been made by L. and A. Maude (2 vols., New York, 1914). A vast literature has grown up about Tolstoy. Among the best lives and studies in English are: C. E. Dupuy, *Great Masters of Russian Literature* (New York, 1886); G. H. Perris, *Leo Tolstoy, the Grand Mujik: A Study in Personal Evolution* (London, 1898); D. S. Merezhkovsky, *Tolstoy as Man and Artist* (New York, 1902); E. A. Steiner, *Tolstoy the Man* (ib., 1904); Aylmer Maude, *The Life of Tolstoy* (2 vols., ib., 1910; 4th ed., 1911); J. A. T. Lloyd, *Two Russian Reformers: Ivan Turgenev and Leo Tolstoy* (ib., 1911); Romain Rolland, *Tolstoy* (ib., 1911); I. L. Tolstoy (his son), *Reminiscences of Tolstoy* (ib., 1914); Constance Garnett, *Tolstoy: His Life and Writings* (London, 1914). Interesting briefer studies of Tolstoy will be found in Matthew Arnold, *Essays in Criticism* (2d series, London, 1889); Ivan Panin, *Lectures on Russian Literature* (New York, 1889); W. D. Howells, *My Literary Passions* (ib., 1895); E. W. Gosse, *Critical Kit-kats* (London, 1896); G. K. Chesterton, *Varied Types* (New York, 1903); P. E. More, *Shelburne Essays* (1st series, ib., 1904); Maurice Baring, *Landmarks of Russian Literature* (London, 1910); W. L. Phelps, *Essays on Russian Novelists* (New York, 1912); M. de Vogüé, *The Russian Novel* (London, 1913); E. A. Steiner, *Tolstoy: The Man and his Message* (New York, 1914).

TOL'TEC, or **TOLTECA**, tŏl-tä'kȧ (people of Tollan, the modern Tula). An early cultured people of Mexico, the subject of considerable historical controversy. According to the general Mexican tradition they were the most ancient civilized race of Mexico, preceding the arrival of the ruder Aztec, who derived their own best culture by absorption from the Toltec. Their capital was at the now ruined city of Tollan or Tula, whence their dominion extended over all the central plateau, eastward to the Gulf and southward to the Maya border. After some centuries of flourishing existence their Empire fell to pieces through internal dissensions and the invasion of barbarous northern tribes about the close of the tenth century, the survivors from war and famine being either incorporated by the conquering Aztec or driven southward to become the culture pioneers among the southern tribes as far as Guatemala. The entire subject of Toltec history is so interwoven with myth and disfigured by exaggeration and uncertainty of dates that it is difficult to arrive at any conclusion, but enough remains to indicate that the Toltec had an important historic existence, either as a distinct race finally absorbed by conquering invaders from the north, or, which is more probable, as the advance guard of the Nahuan stock (q.v.), preceding the arrival of the Aztec by several centuries.

Archæological research has lifted ancient Mexican history out of the obscurity of its confused traditions. Three great layers are recognized. The lowest is called the Archaic, the middle one is called the Toltec, and the top one the Aztec. According to such a classification the Toltec is given a broader signification than in tradition. The Archaic epoch seems to have been brought to a close by the rise of the Maya. The Toltec shows a close connection with the Maya and flourished apparently from the fourth to the twelfth century of the Christian era. Among the great cities of the Toltec period were Tula, San Juan Teotihuacan, and Xochicalco in the valley of Mexico, and possibly La Quemada, Chalchihuites, etc., in Zacatecas and Durango.

TOLU, tô-lo͞o', BALSAM OF. See CHEWING GUM.

TOLUCA, tô-lo͞o'kȧ. The capital of the State of Mexico, Mexico, 34 miles southwest of the city of that name, on the National Railways of Mexico (Map: Mexico, J 8). It is a clean, well-built city, with an altitude of 8761 feet and a cool and healthful climate. Its Institute and state buildings are interesting. It is a busy commercial and manufacturing centre, with breweries, cotton mills, and oil and flour mills. It is well known for its drawn work. In the vicinity is the extinct volcano Nevado de Toluca, a snow-capped peak 15,155 feet high. Tradition assigns the city a Toltec origin; it was an important Aztec pueblo called Tollán at the time of the conquest. Pop., 1900, 25,940; 1910, 31,023.

TOM, Mount. A mountain peak on the west bank of the Connecticut River, in Hampshire Co., Mass., about 4½ miles northwest of Holyoke (Map: Massachusetts, B 3). It is 1214 feet high and affords a wide view of the Connecticut valley. It is a finely kept park, the summit reached by a mountain railway.

TO'MAH. A city in Monroe Co., Wis., 42 miles by rail east by north of La Crosse, on the Chicago, Milwaukee, and St. Paul Railroad (Map: Wisconsin, C 5). The chief industrial establishments are a large saw mill and bridge works of the railroad. A government Indian industrial school is situated here. Pop., 1900, 2840; 1910, 3419.

TOM'AHAWK (Algonquian *tomehagan*, Mohegan *tumnahegan*, Delaware *tamoiheoan*, tomahawk). In general, the hatchet, axe, or spiked club made and used by the American natives. The club form usually ended in a ball bearing a celt or spike of bone. The early white traders adapted the European hatchet to these forms from which developed the type now seen in collections. Practically all of these metal tomahawks are of white manufacture and design. In early colonial literature the tomahawk became a symbol of war; hence the phrase "bury the hatchet." For bibliography, consult *Handbook of American Indians* (Washington, 1907).

TOMAHAWK. A city in Lincoln Co., Wis., 23 miles north of Merrill, on the Wisconsin River, and on the Chicago, Milwaukee, and St. Paul, and the Marinette, Tomahawk, and Western railroads (Map: Wisconsin, D 3). There are pulp, paper, and saw mills, woodworking factories, and a tannery. Bradley Park is of interest. Pop., 1900, 2291; 1910, 2907.

TOMASZOW, tôm'ȧ-shôv. An important manufacturing town in the Government of Piotrkov, Russian Poland, 41 miles northeast of Piotrkov. It has extensive textile mills, with an annual output valued at over $3,000,000. Pop., 1912, 30,000, including many Germans and Jews. Tomaszow was occupied by the Germans in the Great War which began in 1914. See War in Europe.

TOMATO (Sp., Port. *tomate*, from Mexican *tomatl*, tomato), *Lycopersicum esculentum*. A semivinelike annual herb of the family Solanaceæ, native to South America in the region of the Andes. It was formerly called love apple and was considered poisonous. It is now widely cultivated in all temperate regions and considered one of the most wholesome and important garden vegetables. The numerous varieties vary much in form from the red currant forms to the small yellow pear-shaped varieties and the larger red sorts. The red sorts with smooth round fruits somewhat flattened at the ends and varying from 2 to 4 inches in diameter are most in cultivation. The tomato is propagated from seed and in greenhouses often by cuttings. In the temperate regions these are usually started in the greenhouse, hotbed, or cold frame, and the plants transferred to the field when the weather is warm and all danger from frost is past. The plants thrive best in a sandy soil, well fertilized. They are set in the field about 5 feet apart each way and in garden culture are often trained to stakes to keep the fruit off the ground. In the United States the large markets are supplied with tomatoes practically all the year round, the winter crop being grown in Florida and Texas. Also, more tomatoes are grown for canning than any other vegetable. Over 10,000,000 cases, of 24 cans each, are packed annually. Maryland, New Jersey, Indiana, Delaware, and Florida are the leading States in production. Italy has recently developed a new industry in the production of tomato-seed oil which is used for making soap. Tomato rot is caused by various fungi, e.g., *Phytophthora infestans*, *Macrosporium tomato*, attacks the green fruits of the tomato usually at the blossom end and first shows as a small black spot, which increases rapidly until half the fruit is a soft, black, sunken mass. *Fusarium lycopersici* attacks the ripe fruit, covering it with a thick, white mold, which later becomes reddish. It also causes a wilting of the plants. This disease is less common than the others. Repeated sprayings with Bordeaux mixture or other fungicide have been recommended as checks. Diseased fruits should be removed and burned. A stem-end rot of the fruit, that is attributed to over watering and excessive use of certain nitrogenous fertilizers, has been reported as of wide occurrence. The bacterial blight (*Bacillus solanacearum*) attacks also the egg-plant and potato. The leaves become yellow, and the stems wilt and later become brown or black, the plant being destroyed. Spraying for the disease itself appears to have little effect, but preventing insect attack is thought to act as a check. The leaf blight (*Cladosporium fulvum*), often a more serious pest, appears as brownish spots on the under side of the leaves and yellow on the upper. As the disease progresses the leaves curl up and finally drop from the stem. A leaf-spot disease (*Septoria lycopersici*), sometimes troublesome, causes numerous spots to appear on the leaves and young stems, ultimately destroying them. Consult: W. W. Tracy, *Tomato Culture* (New York, 1907); L. H. Bailey, *The Forcing Book* (8th ed., ib., 1909); "Tomato Growing in the South," in United States Department of Agriculture, *Farmers' Bulletin No. 642* (Washington, 1915). See Plate of Vegetables.

TOMATO INSECTS. Many of the insects that attack the tomato also live upon other members of the family Solanaceæ. Among the most common are blister beetles, plant lice, flea beetles, and cutworms, descriptions of which will be found under their respective titles. Others are discussed under Potato Insects; Tobacco Pests; Stalk Borer. The bollworm (q.v.) is sometimes seriously troublesome. See illustration under Cotton Insects.

TOMB (OF. *tombe*, *tumbe*, Fr. *tombe*, from Lat. *tumba*, from Gk. *τύμβος*, *tymbos*, sepulchral mound, grave, tomb; connected with OIr. *tomm*, little hill, Skt. *tunga*, vaulted). A chamber or structure for the burial of the dead. In all ages the belief in immortality and the desire to honor the dead have led to the bestowal of the highest efforts of art upon their burial places. The ancient belief in the intermediate shadowy existence in the tomb of the *ka* or double of the deceased led also to the decoration of the tomb interior with pictured or carved doubles of the appurtenances of mundane life for the delectation of this imprisoned shade, as in the tombs of Egypt and Etruria.

Tombs may be either excavated or structural. Those cut in the rock are called hypogæa. Of these the most noted are those which honeycomb the west bank of the Nile in Egypt, some having roomy chambers with open porches in front; others, more numerous, penetrating deep into the cliffs (that of Seti I extending 800 feet) with a complex of descending passages, chambers, and pits. Other rock-cut sepulchres are in the Valley of the Kings, near Jerusalem; at Petra in Syria, where are Roman hypogæa with elaborately carved façades; the tomb of Darius at Naksh-i-Rustam in Persia; and many Etruscan tombs with less elaborate façades at Cære, Vulci, Corneto, etc. In Lycia, besides hypogæa with carved fronts, there are many tombs above ground hewn each from a single block into the semblance of a timber-framed structure. The splendid Sidon sarcophagi in the Constantinople Museum, shaped like small shrines or temples, almost deserve to be called tombs on account of their size and architecture. Intermediate between the rock-cut and structural tombs are such subterranean or buried structures as the hive-shaped Pelasgic tombs of Mycenæ, e.g., the so-called Treasury of Atreus.

Structural tombs in the open air follow usually the type of a tumulus, shrine, temple, tower, or of a canopy over a solid *podium* or pedestal. The Pyramids of Egypt are the grandest examples of the first type. (See PYRAMID.) The Romans sometimes built circular tombs surmounted by a cone or tumulus of earth or masonry—tombs of Cæcilia Metella, of Augustus, and of Hadrian; the last named, on the Vatican side of the Tiber, over 200 feet in diameter, but like the others destitute of its mound, is now known as Castle Sant' Angelo. The Greeks attempted little in sepulchral architecture except in Asia Minor, where the magnificent tomb of Mausolus (whence mausoleum, q.v.) in Caria was accounted one of the Seven Wonders. The Romans, whose tombs were impressive, perfected the canopy or tower type, as in good examples at Saint-Rémy and Vienne in France, Igel, near Treves, Mylassa in Asia Minor, and many other places. They lined the highways beyond their city gates with tombs of various types and often of great beauty, and in the fourth century developed, in examples like the tomb of St. Helena, the circular tomb with a dome, which was in the Middle Ages adopted by the Moslems and perfected, first on a small scale, but with great richness of detail, in the hundreds of domed and minareted tombs at Cairo known as tombs of the Khalifs, and later in such majestic structures as the tombs of Soliman, Shah Zadeh, and Khurrem at Constantinople, of Humayun at Delhi, and of Mahmud at Bijapur, and in the incomparable Taj Mahal (q.v.) at Agra. Syria abounds in tombs of all types, mostly dating from the early Christian centuries, though not a few belong to the Roman dominion, e.g., the Tomb of Absalom at Jerusalem, the tombs at Palmyra, etc.

In early Christian times and the Middle Ages the practice of interment within the church edifice became common, springing from that of erecting the altar over the tomb or sarcophagus of a martyr (altar tomb). Throughout the Middle Ages the decoration of indoor tombs assumed a great variety of shapes, the most common type being that of a sarcophagus bearing on the cover a recumbent figure of the deceased, under a richly wrought canopy borne by twisted shafts or clustered columns and pointed arches and embellished with sculpture and often with mosaic. These tombs were sometimes freestanding, sometimes set against a wall, or even set high up upon the wall, especially in Italy. Both kinds are to be seen imitated in the celebrated open-air tombs of the Scaligers at Verona, and there are beautiful variants of them in the English cathedrals of York, Salisbury, and Exeter. The bronze shrine of St. Sebaldus at Nuremberg is a late Gothic example of the canopy tomb. The Renaissance adopted these types, but altered their details and filled the churches of Italy, France, England, Germany, and Spain with splendid monuments, some of great refinement and beauty, others marvelously rich and even ostentatious, to the memory of the great dead. The fifteenth-century wall tombs of Italy are especially beautiful, and such churches as Santa Croce at Florence, Santi Giovanni e Paolo at Venice, Santa Maria del Popolo at Rome, and Westminster Abbey became great repositories of sepulchral art. Sculpture played an increasing part in these works, and in the seventeenth and eighteenth centuries was employed in allegorical groups, often theatrical and vulgar.

In modern cemeteries, besides the ordinary graves with stones or obelisks, are to be seen tombs shaped like classic shrines, and occasionally more elaborate structures fronted or surmounted by well-wrought groups of allegorical sculpture. Among important mausolea may be mentioned the impressive dome of the Invalides at Paris, serving as the tomb of Napoleon, and the massive Grant mausoleum in New York. Neither of these compares in splendor, however, with some of the Oriental tombs mentioned above. Modern sepulchral art is inferior to mediæval, Renaissance, or Oriental art. The modern preference is to erect imposing monuments to the dead in the frequented squares of populous cities, rather than over their quiet graves in remote cemeteries. Consult: Tosi and Becchio, *Altars, Tabernacles, and Tombs* (Lagny, 1843); E. W. Trendall, *Designs for Monuments, Cenotaphs, Tombs, and Tablets* (London, 1856); Brindley and Weatherly, *Ancient Sepulchral Monuments* (ib., 1887); Lawrence Weaver, *Memorials and Monuments, Old and New* (New York, 1915); and for Greek and Roman tombs, O. M. Stackelberg, *Die Gräber der Griechen in Bildwerken und Vasengemälden* (Berlin, 1837); Rossi, *Roma sotteranea cristiana* (Rome, 1887–88); M. de G. Davies, *Five Theban Tombs* (Oxford, 1913). See BURIAL; CAMPO SANTO; CEMETERY; CENOTAPH; NECROPOLIS; PYRAMID; SEPULCHRAL MOUND.

TOMBIG'BEE RIVER. One of the chief rivers of Alabama (Map: Alabama, A, B 4). It rises in the northeast corner of Mississippi and flows in a south-southeasterly direction with numerous abrupt windings. After a course of 450 miles it joins the Alabama River to form the network of channels composing the Mobile and Tensas rivers, which empty through several arms into Mobile Bay. The largest tributary is the Black Warrior, which drains the north central part of Alabama. The Tombigbee is navigable to Aberdeen, Miss., 410 miles from Mobile Bay.

TOMB OF THE SCIPIOS. See SCIPIOS, TOMB OF THE.

TOM BROWN'S SCHOOL DAYS. A noted story of life at the famous Rugby School under the rule of Thomas Arnold, by Thomas Hughes (1856), and continued in *Tom Brown at Oxford* (1861).

TOMBS, SIR HENRY (1824–74). An English soldier, born at sea and educated at the India Company's Military College at Addiscomb. In 1841 he entered the service of the East India Company as second lieutenant and soon distinguished himself. In the Sepoy Mutiny he won the Victoria Cross by his gallant conduct at the siege of Delhi in 1857. Afterward he took part in the capture of Lucknow, the relief of Shahjahanpur, and in an expedition to Shaksbad. In 1863 he was made brigadier general and in 1867 major general. During his later years he was in command of several important expeditions in India, but in 1872 resigned his command and returned to England, where he died. Consult: F. W. Stubbs, *History of the Bengal Artillery* (2 vols., London, 1877); G. B. Malleson, *History of the Indian Mutiny* (ib., 1878–80); and Field Marshal Earl Roberts, *Forty-one Years in India* (ib., 1898).

TOMBS, THE. The city prison of New York, erected in 1838, and so named from its massive and gloomy appearance. It was torn down in 1898 and replaced by a larger building.

TOMBS OF THE MEDICI. See MEDICI, TOMBS OF THE.

TOMCOD. One of the small codfish of the genus *Microgadus*, as *Microgadus tomcodus* of the Atlantic coast, or *Microgadus proximus* of the Pacific. They are very abundant and of considerable importance as food. See Plate of CODFISH AND ALLIES.

TOM CRINGLE'S LOG. A sea yarn by Michael Scott, which first appeared in *Blackwood's Magazine.*

TOMÉ, tō-mā′. A seaport of Chile, 12 miles north of Concepción, and a shipping point for grain. Municipal pop., 1903, 6358.

TOME. An old settlement on the Rio Grande, Valencia Co., N. M. It was settled early in the sixteenth century by 70 Spanish families. For a century it was the most important place in the Rio Grande valley, and for a time was the seat of government of the colony. Sept. 7, 1708, the town was sacked by the Comanche Indians, who killed half of the inhabitants and carried many others into captivity. Pop., 1910, 512.

TOME (tōm) **INSTITUTE.** See JACOB TOME INSTITUTE.

TOMELLOSO, tō′mĕl-yō′sō. A town in the Province of Ciudad Real (La Mancha), Spain, in the District of Alcázar de San Juan. The town dates from the sixteenth century and is well built. The chief industry is the cultivation of the vine and of cereals, and there are manufactures of spirits, leather goods, and cloths. Pop., 1900, 13,917; 1910, 17,733.

TOM JONES. A well-known novel by Henry Fielding (1749).

TOMLINE, tŏm′lĭn, SIR GEORGE PRETYMAN (1750–1827). An English divine, Pretyman by name, who assumed the cognomen of Tomline on falling heir to an estate in 1803. He was born at Bury St. Edmunds and was educated in that town and at Pembroke Hall, Cambridge, where he formed the acquaintance of the younger Pitt—as his tutor in 1773—which was the making of his own career. In 1783 he became private secretary to Pitt, when that statesman was made First Lord of the Treasury, and his mathematical ability was serviceable to his patron. Tomline was made dean of St. Paul's and Bishop of Lincoln in 1787, and received the see of Winchester in 1820. In 1821 appeared his memoir of Pitt. This work was disappointing in that it took no notice of Pitt's career after 1793 and made scant use of opportunities the writer had to depict the inner history of the time.

TOM′LINSON, CHARLES (1808–97). An English scientist, born in London, studied at Wadham College, Oxford, and under George Birkbeck, the founder of the London Mechanics' Institute. For a while he had a school with his brother Lewis, at Salisbury. Becoming known for original investigation, he was called to London, where he was appointed lecturer on experimental science at King's College School. In 1872 he was elected to the Royal Society, and in 1874 he took a leading part in founding the Physical Society. As a scientist Tomlinson made valuable contributions to the knowledge of the surface tension of liquids. His last years were devoted to literature, and in 1878–80 he held the Dante lectureship at University College, London. Besides several works on mechanics and the useful arts, he published: *The Sonnet, Its Origin, Structure, and Place in Poetry* (1874); a translation of Dante's *Inferno* (1877); *The Literary History of the Divine Comedy* (1879); *Dante, Beatrice, and the Divine Comedy* (1894); and a volume of original *Sonnets* (1881).

TOMLINSON, EVERETT TITSWORTH (1859–). An American author, born at Shiloh, N. J. He was educated at Williams College, and served as principal of the high school at Auburn, N. Y., in 1881–83, and as head master of the preparatory department of Rutgers College in 1883–88. After 1894 he wrote many popular stories for boys, usually with historical setting.

TOMMASEO, tōm′mȧ-zā′ō, NICCOLÒ (1802–74). An Italian poet, critic, philosopher, and lexicographer, born at Sebenico, in Dalmatia. He went to Padua to study law, but turned to literature. In Florence he collaborated on Viesieux's *Antologia,* which the government suppressed in 1832. Tommaseo, having to leave Florence, went to Paris, where he endeavored to make the French better acquainted with his countrymen, through various writings, e.g., *Dell' Italia* (1835). In 1838 he took up his abode in Corsica, and there made a collection of popular songs, *Canti popolari corsi, toscani, greci e illirici* (1841). He returned to Venice, where he was permitted to stay from 1839 to 1848. In January, 1848, he was arrested because of his liberal opinions, but the Manin (q.v.) insurrection freed him. After the fall of Venice in 1849 he went to Corfu, going thence in 1854 to Turin, where he began the publishing of his great *Dizionario della lingua italiana.* He passed his last days in Florence, refusing the honors and positions offered him as a venerable patriot of arisen Italy.

As a philologist he possessed vast and accurate erudition. His aim in all his writings, religious, moral, and pedagogical treatises, political essays, philological, literary, and critical works, poems, and ballads is constantly educational. These reveal vigor and acuteness. As a critic of literature he is hampered by classic prejudices and an inborn polemical spirit. Among his other most valuable contributions are: *Il dizionario estetico* (1840), *Bellezza e civilta* (1857), *Ispirazione e arte* (1858), and *Storia civile nella letteraria* (1872), besides a noteworthy *Commento alla commedia*. Consult P. Prunas, *La critica, l'arte, e l'idea sociale di Niccolò Tommaseo* (Florence, 1901), and B. Croce, "N. Tommaseo," in *La Critica*, vol. x (Naples, 1912).

TOMMASI, tôm-mä'zê, Donato (1848–1907). An Italian chemist and electrician, born in Naples and educated at Paris and at the University of Brussels. He took as his specialty electrochemistry, a branch of science in which he made valuable investigations. His discoveries include various methods for separating and extracting metals by electricity (1892) and an accumulator which has been much used on railways. His publications include: *Traité théorique et pratique d'électrochimie* (1889); *Traité des piles électriques et des accumulateurs* (1890); and *Manuel prâtique de galvanoplastie* (1890).

TOMMY ATKINS. The popular name for a private soldier in the British army. It had its origin in the government usage of the fictitious name of Thomas Atkins to designate the place of the soldier's signature in such documents and army forms as were to be signed by him.

TOMOCHICHI, tō'mō-chē'chē (one who makes a bird fly upward) (c.1642–1739). A noted chief of the Yamacraw, a detached band of the Creek confederacy, in the early period of Georgia colonization. He was a native of the lower Creek town of Apalachukla near the site of present Columbus, Ga. He had incurred the displeasure of the confederacy and withdrew with his immediate followers and established himself on the Savannah River at Yamacraw Bluff, now a part of Savannah. Here he concluded a treaty of friendship with Governor Oglethorpe, and through his influence a treaty was made in 1733, at Savannah, with the lower Creeks, by which the latter ceded all their claims from the Savannah to the Altamaha. In 1734, with a retinue, he accompanied Oglethorpe to England. A monument to him was erected in Savannah.

TOMPA, Mihály (1817–69). A Hungarian poet, born at Rimaszombat and educated at Saros-Patak. He served in the Honved army in the revolution of 1848, and in 1852 he became a minister at Hanva, where he remained until his death. In 1847 he was elected to the Kisfaludy Society and in 1858 to the Hungarian Academy. His first work was *Népregék, Népmondák* (Pest, 1846), a collection of popular tales. His *Szuhay Mátyás* (1847), a comic story in verse, was crowned by the Hungarian Academy. His complete works were published in 1884 (5 vols.). Consult Ferenczy, *Mihály Tompa* (Kaschau, 1878), and Kont, *Geschichte der ungarischen Litteratur* (Leipzig, 1906).

TOMP'KINS, Daniel D. (1774–1825). An American political leader and Vice President of the United States. He was born in Fox Meadows (Scarsdale), Westchester Co., N. Y., graduated at Columbia in 1795, and in 1797 was admitted to the bar. In 1804 he was elected to Congress, but before taking his seat was appointed by Gov. Morgan Lewis to the vacancy on the State Supreme bench caused by the promotion of Judge Kent to the chief justiceship. In 1807 he became the candidate of the Clintonian Republicans for Governor to succeed Morgan Lewis, who had been renominated by the Livingston party with strong Federalist support. He was elected over Lewis by 4085 majority and was reëlected four times, serving 10 years. During his third term an attempt to secure a charter from New York State for the Bank of America was accompanied by a wholesale bribing of the State Legislature. After the lower house had sanctioned the charter, on March 27, 1812, Governor Tompkins prorogued both houses—a power then granted by the constitution, but never before exercised. The charter was granted at the next session of the Legislature, but Tompkins' action had increased his popularity. During the War of 1812 Governor Tompkins recruited and equipped 40,000 militia in New York State, providing funds for this raised partly on his personal security. On a recommendation made in his last message to the Legislature in January, 1817, the New York Legislature passed a law setting all slaves free on and after July 4, 1827. From 1817 to 1825 he was Vice President of the United States. Consult De A. S. Alexander, *Political History of the State of New York* (3 vols., New York, 1906–09).

TOMP'SON, Benjamin (1642–1714). An American poet, born at Braintree, Mass. He was educated at Harvard College and became a school teacher in Cambridge. He is known by his poem on King Philip's War, *New England's Crisis* (1675).

TOM'S. A former London coffeehouse in Covent Garden, a fashionable resort, and the headquarters of a club founded in 1764, which among its 700 members included many noted names of the day. Tom's was taken down in 1865.

TOMSK, tômsk. A government of West Siberia (Map: Asia, K 3). Area, about 331,159 square miles. The southern and southeastern parts belong to the region of the Altai Mountains and contain many snow-clad peaks, some of them 11,000 feet high. The Kuznetzky Alatau, along the eastern frontier, is densely wooded and rises to about 6000 feet. The remainder of the region is mostly low and consists of vast densely wooded marshes and open steppes. The region is watered mainly by the Obi (q.v.) and its tributaries, including the Irtysh (q.v.). The climate is severe and unhealthful in the lowlands. The mineral deposits of the Altai Mountains are being gradually opened up and give promise of great abundance. Agriculture is the principal occupation, and the output of cereals is far above the local demand. Stock raising is also an extensive industry. Manufactures are undeveloped, but the trade with Mongolia is on the increase and there is considerable navigation on the Obi. The trade with European Russia also shows an increase since the construction of the Trans-Siberian Railway. Pop., 1914 (est.), 3,919,800, of whom the natives (Tatars, Samoyeds, Ostiaks, etc.) numbered only about 75,000, the remainder being Russians.

TOMSK. The capital of the Siberian government of Tomsk and the intellectual centre of Siberia, situated on the Tom, a tributary of the Obi, and connected by a short line of 54 miles with the Trans-Siberian Railway (Map: Asia, K 3). It is one of the finest cities of Siberia, with electric lighting and street railways, but without an adequate water supply and unsatisfactory in its sanitary arrangements. Its importance dates from the year 1824, when gold was discovered in its vicinity. The university, established in 1888, has two faculties of medicine and law, 987 students, and a library of 226,000 volumes. The commerce is very extensive, Tomsk being one of the chief distributing centres of Siberia. Pop., 1911, 112,083.

TOMS RIVER. The county seat of Ocean Co., N. J., 35 miles southeast of Trenton, at the head of Toms River and Bay, and on the Pennsylvania and the Central of New Jersey railroads (Map: New Jersey, D 4). It is a summer resort. Farming, especially cultivation of cranberries, fishing and oyster planting, lumbering and yacht building, are leading industries. Pop., 1915, about 2000. Early in the Revolutionary War a small blockhouse was erected to protect the salt works here. On March 24, 1782, this blockhouse, occupied by Capt. Joshua Huddy and 25 men, was attacked by a larger force of Loyalists under Capt. Evan Thomas and Lieut. Owen Roberts and was captured. Immediately afterward the village itself was almost totally destroyed. Consult a pamphlet by Striker, *The Capture of the Old Blockhouse at Toms River, New Jersey* (Trenton, 1883).

TOM THUMB. See Stratton, Charles Sherwood.

TOM-TOM. See Tam-Tam.

TON. See Weights and Measures.

TON. See Measurement of Ships for Tonnage.

TONAL′ITY (from *tonal*, from *tone*, OF. *ton*, from Lat. *tonus*, from Gk. *τόνος*, tone, sound). In music, the grouping of certain chords around a central tonic chord. The principle rests upon the relationship which various chords bear to one another. Briefly stated, a tone is related in the first degree to all tones forming consonant intervals with it; in the second degree to all tones forming dissonant intervals with it. Thus we can establish the relationship of D to C by means of the chord of the dominant seventh d-f♯-a-c, which is the dominant of G major, which, in turn, is the dominant of C major.

The relationship of single tones becomes intelligible only through the agency of chords. It is sufficient to recognize only two degrees. Since, when considering the relationship of chords, each chord is considered a tonic chord, it will perhaps be best to speak of triads. A sharp distinction must be made between similar and dissimilar triads. If a major triad is followed by another major, or a minor triad by another minor, the two major triads are similar, as are also the two minor triads. But if a major triad is followed by a minor, or vice versa, the two triads are dissimilar. It must also be borne in mind that when speaking of major triads all intervals are reckoned upward; when speaking of minor triads all intervals are reckoned downward. A triad is related in the first degree to all similar triads whose fundamental tone is related in the first degree to the fundamental tone of the original triad. Thus, the triad of C major is related in the first degree to the similar major triads of G, F, E, A♭, E♭, A. It is also related in the first degree to the dissimilar minor triads whose fundamental lies a fifth below any of the tones of this C major triad. These are F, A, C, a fifth below C, E, G, respectively. To these must also be added the triad built upon the mediant, which in a major key is always a minor triad, and vice versa. Hence every triad is related to 10 other triads in the first degree. In the case of a minor triad similar relations exist.

All triads other than the 10 just mentioned are related to the original triad in the second degree. Here the degree of affinity may be more or less remote. Consult: H. Riemann, *Musikalische Syntaxis* (Leipzig, 1877); id., *Skizze einer neuen Methode der Harmonielehre* (ib., 1880); id., *Systematische Modulationslehre* (ib., 1887). See Comma; Consonance; Dissonance; Harmony, *Chords;* Key.

TON′AWAN′DA. A city in Erie Co., N. Y., 9 miles by rail north of Buffalo, on the Niagara River and the Erie Canal and on the New York Central and the International railroads (Map: New York, B 4). It is connected with North Tonawanda by two bridges. The prominent features of the city include the armory, the high school, the public library, and a park. Tonawanda is an important lumber market and is also interested in manufacturing, the chief products being steel, lumber, roofing, and paper boards. Pop., 1900, 7421; 1910, 8290; 1915 (State census), 9147.

TON′BRIDGE, *pronounced* Tunbridge. A market town in Kent, England, on the Medway, 29 miles southeast of London (Map: England, G 5). The manufacture of toys, boxes, and articles of wood in Tonbridge ware, a mosaic veneer of beech, holly, etc., is a specialty. A notable feature is the remains of a mediæval castle which stands on the Medway, near the entrance of the town. Among other structures are the parish church and the grammar school, founded in 1553. Pop., 1901, 12,736; 1911, 17,247.

TONE. In music, the name given to the larger intervals in the diatonic scale, so called in contradistinction to the semitones (q.v.), or smaller intervals. Theoretically some of the intervals called tones are larger than others, and none of them are equal to two semitones; thus, in the scale of C, the intervals CD, FG, and AB are all equal; but DE and GA, which are also called tones, are smaller; and the semitones, EF and BC, are larger than half even of the larger tones. In instruments, however, which are tuned according to the equal temperament (q.v.), all the tones are made equal, and each equivalent to two semitones.

TONE, Theobald Wolfe (1763–98). An Irish revolutionist. He was born in Dublin, where he was educated, graduating at Trinity College. He was called to the Irish bar in 1789. He was one of the founders of the first club of United Irishmen at Belfast and similar organizations in other parts of Ireland and agent of the Roman Catholic committee (1792); was implicated in Jackson's treasonable designs with the French government in 1794, but was allowed to go to Philadelphia, U. S. A., in 1795. In the following year, however, he went to France for assistance and returned suddenly to Ireland, recalled by rumors of a revolt. In the expedition to Bantry Bay he was adjutant general to the commander Hoche, but the fleet was driven off the coast and scattered. In 1798 he again set sail for Ireland with a small French expedition and was captured by an English fleet off Lough Swilly. Having been sentenced to be hanged, he cut his throat, dying a few days later. Consult *The Life of Theobald Wolfe Tone, etc., with his Political Writings*, edited by his son, W. T. W. Tone (2 vols., Washington, 1826), and Harry Graham, *Splendid Failures* (London, 1913).

TONE COLOR. In music, the quality of the tone of musical instruments or of the human voice. See Clang Tint, Explanation of.

TO'NER, Joseph Meredith (1825–96). An American physician, born in Pittsburgh, Pa. He graduated at Jefferson Medical College in 1853 and two years afterward settled in Washington, D. C., where he founded the Providence Hospital and became identified with several other similar institutions. In 1871 he gave the fund which established the well-known Toner lectures. He was president of the American Medical Association and of the American Health Association in 1874 and was vice president of the International Medical Congress of 1887. Toner was one of the very few American physicians who took an interest in the history of medicine, and his *A Century of American Medicine* (1876) still remains a standard work. His publications include, besides: *Compulsory Vaccination* (1865); *Annals of Medical Progress and Medical Education in the United States* (1874); *Medical Men of the Revolution* (1876).

TON'GA ISLANDS, or **Friendly Islands.** A group of Polynesian islands in the Pacific Ocean, about 350 miles southeast of Samoa, extending from lat. 15° to 23½° S. and from long. 173° to 177° W., the Fiji Islands being to the northwest (Map: Australasia, L 4). The Tonga Islands form a native kingdom, but are under the protection of Great Britain. They number about 100, but only Tongatabu, Eua, and Vavau are of any importance, the first being low, the others of moderate height. Area, about 390 square miles. The islands lie generally in a long north and south chain and form the subgroups of Tonga, Nomuka, Haapai, and Vavau, but the outlying islands Niuatobatabu or Keppel Island, Tafahi or Boscawen, and Niuafoou are included in the Kingdom of Tonga. The residence of the native King and seat of government is at Nukualofa in Tongatabu (Holy Tonga). The eastern islands are of coral limestone formation, low and comparatively level. In the Tonga subgroup is the largest and most fertile island of all, Tongatabu. It is in the south and contains about 140 square miles. It has about half the population of all the Tonga Islands. The western row of islands are volcanic, high, and steep. Of these Late and Tofoa are active, and Kao (about 2850 feet high) is extinct. The climate of the Tonga Islands is oppressive and humid. The annual rainfall is heavy, over 75 inches. Serious earthquakes are not infrequent, and small islands rise suddenly at times and as suddenly disappear. A hurricane wrought havoc in Vavau in 1900. The flora is rich, especially in palms. The native fauna is comparatively insignificant; there needs to be mentioned only the large fruit-eating bat (*Pteropus tonganus*).

The main islands are covered with luxuriant vegetation. The soil is rich. The land is leased, not sold; and as its tenure is not assured, improvements are both meagre and poor. Copra and fungus are exported, and tapa and mats are made. The imports, mostly from Australia and New Zealand, amounted to £81,044 in 1913–14 and include draperies and foods; the exports amounted to £82,321, consisting mainly of copra and green fruit. There is regular steam communication with the neighboring British possessions. There are many good harbors. The revenue in 1913 amounted to £32,489 and the expenditures to £39,103. There is no debt. The population was given in 1911 as 23,900, nearly all natives, and among the most civilized of the Polynesians. They are agriculturists and adept seafarers. While eager to learn and imitate, they lack qualities necessary to success.

The Tonga Islands were discovered in 1643 by Tasman. He gave to Tongatabu the name of Amsterdam and called Eua and Nomuka respectively Middleburgh and Rotterdam. In 1781 the Spanish navigator Maurelle discovered Vavau and several of the neighboring islands. In 1789 Lieutenant Bligh, of the *Bounty*, visited Nomuka. In 1791 Captain Edwards, in the *Pandora*, made two visits to the group. In 1796 a mission was established at Tongatabu. This was the first missionary enterprise on the island, but was abandoned a few months later owing to the violence of the islanders. In 1822 the first Wesleyan missionary landed on the island. The mission was, however, not fully established until 1826. All the natives are now Christians—many Methodists, some Roman Catholics. In 1773 and in 1777 they were visited by Cook, who explored them, and gave them the name of Friendly Islands on account of the attitude of the natives. Before the breaking out of the civil wars early in the nineteenth century the islands were under the rule of two reigning families. During this political upheaval the local hereditary chiefs declared their independence, but were united under the wise rule of George I, who in 1875 introduced a sort of constitutional government, allowing the chiefs a share in the administration. Treaties were concluded with Great Britain, Germany, and also, in 1888, with the United States. The privilege of building a naval station was abandoned by Germany in 1899 in favor of Great Britain, which country declared its protectorate over the group in that year. The present ruler, King George II, is assisted by a Legislative Assembly, meeting every three years, composed partly of hereditary nobles and partly of members elected on a property qualification. There are a cabinet, a Privy Council, and judiciary.

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TON'GALAND, or **AMATONGALAND.** A district of Zululand and accordingly of Natal in southeast Africa (Map: Cape of Good Hope, L 6). It forms the northern neck of Zululand. Area, 1280 square miles. The Lebombo Mountains border it on the west. The country is generally level and low. The climate is very unhealthful. The inhabitants are Zulu-Kafirs, the Amatonga. The possession of Tongaland was strongly desired by the Boers, since it would have furnished them an outlet to the sea and a haven. Great Britain was eager to frustrate their plans, however, and declared Tongaland under British protection, June, 11, 1895. It was annexed to Zululand (q.v.), Dec. 27, 1897. This action embraced also the small possessions of the Sambana and Umtegiza chiefs, which formed the narrow portion of Tongaland west of the Pongola River. Zululand, including Tongaland, was annexed to Natal, December, 1897.

TONGAS. See Tlinkit.

TONG-HAK, tông-häk′ (Sinico-Korean, Oriental culture). The watchword of a revolutionary party in Korea (Chosen), founded in 1859 by a native Korean scholar named Choi. They were prominent in a rebellion preceding the Chino-Japanese War of 1894–95. See Korea.

TONGKAH. See Salang.

TONGKING′, TONKIN′, or **TONQUIN,** tŏn′kēn′, *Fr. pron.* tôɴ′käɴ′. A French protectorate in French Indo-China (q.v.), situated just south of the tropic of Cancer, bordering the Gulf of Tongking (Map: French Indo-China, D, E 2). Area, estimated at 46,000 square miles. Tongking has a heavily forested plateau in the north. The eastern part is tilled and contains slate and limestone. The protectorate is traversed in a southeasterly direction by the navigable Red River (q.v.), or Song-ka, its delta district covering some 5000 square miles. This district, traversed by many streams, is especially fertile and well tilled. The climate for the greater part of the year is hot and humid. Storms are frequent in summer. The flora in the southwest resembles that of India; that of the northeast is akin to that of southern China. Nuts and tropical fruits abound.

Copper, iron, and coal are mined. The soil is very fertile, and the cattle industry is prominent. Opium, cacao, sugar, tea, cotton, corn, coffee, and tobacco are cultivated. Rice, the staple crop, equals the best in the world. Furniture, glass, silk, cottons, indigo, paper, oil, and sugar are manufactured. The commerce has rapidly increased. The imports consist largely of machinery, metals, and textiles. The main exports are rice and animal products. The leading commercial points are Haiphong (the chief port, possessing a fine harbor), Kwangyen, and Nam-Dinh. A railway extends from Haiphong to Hanoi. From Hanoi a line runs to Lungchow, another to Yünnanfu, and a third southward along the coast to a point a little beyond Vinh. The Yünnan line carries a large transit trade. There are ocean cables to Hué and Hongkong. The largest city is Hanoi, the seat of the resident superior of Tongking, as well as of the Governor-General of French Indo-China. There are 21 provinces and four military territories. The local budget for 1914 balanced at 8,994,000 piasters (piaster = 0.469).

Estimates of population vary widely; an officially published estimate relating to 1911 is 6,118,000. Europeans, exclusive of the military, number upward of 6000. The race is Annamese. Besides these, who dwell largely in the delta region and who are taller and darker than their kindred in Cochin-China and Annam, the interior contains a number of more or less primitive peoples, such as the Thos (q.v.) of the Claire River basin, the Muongs (q.v.) of the Black River valley, and others who belong to the Thai (q.v.). The Chinese number upward of 35,000. Several hundred thousand of the inhabitants profess Roman Catholicism. Tongking was an independent state before it came under the control of Annam in 1802. In 1873 the first military expedition of the French was sent into the territory, but by agreement the next year they retired. In 1882 the French government, having conceived the design of securing the delta of the Red River for French commerce, sent an expedition against the predatory Black Flags, a Chinese soldiery, representing a remnant of the Taiping rebels. The French sailed up the Red River and occupied the citadel of Hanoi. Annam lent her support to the Black Flags, whereupon in August, 1883, the French fleet under Courbet bombarded Hué and compelled Annam to accept a French protectorate and to allow France to prosecute her designs with regard to Tongking. The French pushed their operations with success, but soon had to face a war with China, to whose suzerainty Annam was still nominally subject. This conflict, which lasted a year (1884–85), left France in virtual possession of Tongking. In 1887 Tongking was made a part of French Indo-China.

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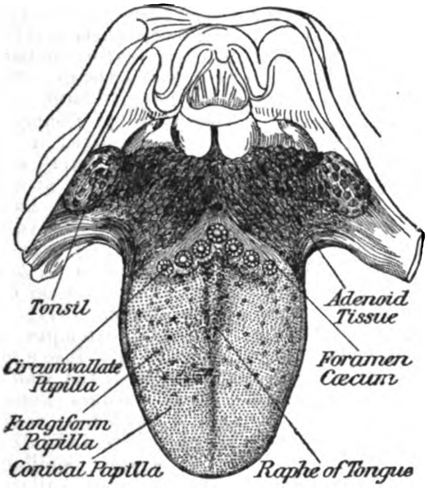
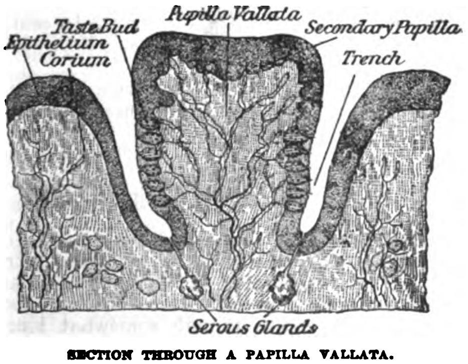
TONGKING, Gulf of. An arm of the South China Sea extending northward between French Indo-China on the west and the Chinese island of Hainan together with the Lei-chau peninsula on the east (Map: French Indo-China, E 2, 3). It is 150 miles wide and 300 miles long and receives the Red River. Its depth is everywhere less than 300 feet.

TONGUE (AS. *tunge*, Goth. *tuggō*, OHG. *zunga*, Ger. *Zunge*, tongue; connected with OLat. *dingua*, Lat. *lingua*, tongue). A symmetrical muscular organ, extending from the hyoid bone forward and downward to the lips in front and occupying the buccal cavity. The superior surface, borders, and anterior third of the inferior surface are free, while the remaining parts are attached to adjacent parts by the investing mucous membrane and subjacent structures. At certain points this membrane, on leaving the tongue, forms distinct folds, containing fibrous or muscular tissue, which act to a certain extent as ligaments of the tongue. The most considerable of these folds is termed the frænum (or bridle) of the tongue and connects its anterior free extremity with the lower jaw. It acts as a strong ligament and limits the backward movement of the tip of the tongue. In rare cases this ligament extends abnormally to the tip, so as to interfere with speech and mastication, and the child is said to be tongue-tied; recourse must be then had to division of the frænum, popularly known as cutting the tongue.



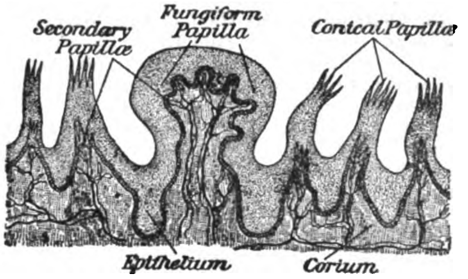
HUMAN TONGUE.

Other folds of mucous membrane (the glosso-epiglottid folds) pass from the base of the tongue to the epiglottis, while from the sides of the base, passing to the soft palate, are seen two folds on either side, known as the pillars of the fauces. (See PALATE.) The superior surface of the tongue is divided into two symmetrical lateral parts by a median longitudinal furrow beginning at the tip and extending back about two-thirds of the tongue's length. The various kinds of papillæ which are seen on their surface are described under TASTE. At the back of the surface, just behind the circumvallate papillæ (papillæ vallatæ), are large mucous glands, extending into long and capacious canals and helping to secrete the fluid that moistens the tongue. On the inferior surface, the longitudinal furrow, which extends from the tip to the frænum, is deeper than on the upper surface; on each side of it veins are seen running forward; and immediately beneath the tip is a cluster of mucous glands, known as the glands of Nuck (Dutch anatomist, 1650–92). The posterior extremity, or base, is flattened and extended laterally before it is inserted into the hyoid bone.



SECTION THROUGH A PAPILLA VALLATA.

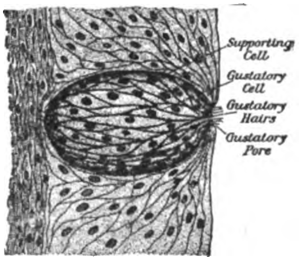
The muscles of the tongue are usually divided into two groups, viz., the extrinsic muscles, which attach the tongue to certain fixed points external to it and move it on them, and the intrinsic muscles, which pass from one part of the tongue to another, constitute its chief bulk, and move it on itself. These intrinsic muscular fibres run vertically, transversely, and longitudinally and are so interlaced as mutually to support one another and to act with the greatest advantage. By the action of the various muscles the upper surface of the tongue may be made concave or convex or may be pressed against the roof of the mouth; the tip may be protruded straight out or laterally, upward and downward, and to any recess (as e.g., a hollow tooth) within the mouth where food might lodge; and the whole organ may be drawn back. The nerve supply to the tongue is motor and sensory. The motor nerve is the hypoglossal. The sensory nerves are the lingual (or gustatory) branch of the fifth, which confers sensibility on the mucous membrane of the anterior two-thirds of the tongue; the lingual branch of the glossopharyngeal, which confers ordinary sensibility and the sense of taste on the posterior third of the tongue; the chorda tympani, which is the special nerve of taste for the anterior two-thirds of the tongue.



SECTION SHOWING STRUCTURE AND ARRANGEMENT OF PAPILLÆ.

The functions of the tongue are gustation, prehension (in man and monkeys this function is supplied by the hand), mastication, insalivation, deglutition, and speech; and in the case of the Gasteropoda, trituration of the food.

The tongue is subject to several diseases, among which may be mentioned glossitis, or inflammation of the tongue, tuberculosis, and syphilis; new growths, usually malignant in nature; certain affections which the mucous membrane of the tongue shares with the skin, such as herpes, lichen, and leucopacia. It is also subject to excoriations, ulcers, and fissures. Macroglossia is a term applied to certain chronically enlarged conditions of the tongue. It is a condition often found in cretins and is probably due in this case to lymphangioma. Hypertrophy and also cancer may attack the tongue.



VERTICAL SECTION THROUGH A TASTE BUD.

Tongue in Diagnosis. The tongue furnishes a valuable index in the diagnosis of disease and presents certain characteristic appearances in many morbid conditions. An inspection of this organ is an important part of any clinical examination, and its condition should be noted with reference to color, size, muscular tone, mobility, dryness, and special sensation. The tongue is pallid in anæmia and bluish in cyanosis. It is large and tender in glossitis, bright red and studded with brilliant points in scarlet fever (the strawberry tongue). It is apt to be flabby, indented by the teeth, and coated in diseases of the gastrointestinal tract. It is ulcerated in aphthous fever, thrush, stomatitis, the secondary stages of syphilis, mercurial poisoning, etc. It is coated with brown fur (sordes) and tremulous in profound septic conditions, such as typhoid fever and pyæmia. The elongated and pointed tongue is supposed to indicate irritation of the stomach and bowels, whereas the broad flabby tongue indicates atony and sluggish action on the part of the same organs. In acute diseases with dryness of the tongue, improvement sets in when the tongue becomes moist, and this is nearly always considered a favorable symptom. Spasm, tremor, and one-sided paralysis of the tongue are seen in various nervous diseases. Tremor is a frequent symptom of acute and chronic alcoholic poisoning. See ALIMENTARY SYSTEM.

TONIC (from Gk. τονικός, *tonikos*, relating to tone, from τόνος, *tonos*, tone, sound, tension, strength, cord). An agent or medicine that promotes nutrition and, in common parlance, gives tone to the system. It is a rather vague term, since any medicine which corrects a pathological condition in the body will make the patient feel better and stronger, e.g., a cholagogue, by stimulating the flow of bile and clearing out the intestines, may act as a tonic. Tonics are to a certain degree stimulant, but their effect is supposed to be more permanent without producing obvious stimulation. Most tonics act primarily through the nervous system; their effect upon the muscular system becomes secondary. They are of especial value during convalescence from wasting fevers. Typical medicines of this class are iron, quinine, strychnine, and the vegetable bitters. Those acting especially on the heart are digitalis, squill, and convallarin; those given for anæmia are iron, manganese, arsenic, and cod liver oil; those acting especially on the stomach are cinchona, nux vomica, and other simple bitters. Strychnine is of peculiar value as a tonic, acting both on the spinal cord and general circulation. For the general nervous system, in addition to these drugs, phosphorus, small doses of quinine, and the valerianates are supposed to be peculiarly efficacious. Most of these drugs are described at length under their own titles. More important than drugs, however, as tonic agents, are baths, massage, and exercise in the open air. Sea bathing, shower baths, sponge baths, spinal douches, and various medicated baths are most powerful tonics in suitable cases. See BATH; EXERCISE; HYDROTHERAPY.

TONIC, or KEYNOTE. In music, the note which forms the basis of any scale or key and on which a piece of music written in that key naturally closes. The tendency of modern harmony is to conceive the tonic not as a single tone, but as a triad built upon that tone. See KEY; TONALITY.

TONICA, tō-nē'kȧ, or **TUNICA.** A peculiar tribe, constituting a distinct linguistic stock, who lived, when first known to the French (about 1700), on the lower Yazoo River in Mississippi, near its junction with the Mississippi, where a mission was established. Probably at an earlier period they had lived at the Tunica Old Fields in the county bearing their name in the northwestern corner of the same State. They made an alliance with the French, but were hostile to most of their Indian neighbors, particularly the Chickasaw, and in 1706 nearly exterminated the Huma in a massacre near New Orleans. Subsequently they removed to the east bank of the Mississippi, about opposite Pointe Coupée, below Red River, where they still lived in 1802, numbering then 120. In 1817 they were settled about 90 miles up Red River, where about 25 persons were found near Marksville, La., in 1886 by Gatschet, who obtained the first vocabulary of their language. In 1910 they numbered 43. Consult J. R. Swanton, *Indian Tribes of the Lower Mississippi Valley and Adjacent Coast of the Gulf of Mexico* (Washington, 1911).

TONIC SOL-FA. Various attempts have been made at different times to introduce a musical notation which dispenses with the staff and its lines and spaces. Jean Jacques Rousseau suggested, but afterward discarded, a notation where the notes of the scale were indicated by the Arabic numerals. A system similar to Rousseau's in its leading features, called the tonic sol-fa, has, through the influence of its principal promoter, the Rev. John Curwen (who obtained his main principles from the writings and practice of Miss Glover of Norwich), been brought into use to a considerable extent in singing schools in England. It proceeds on the principle of giving the chief prominence to the fact that there is in reality but one scale in music, which is raised or lowered according to the pitch of the key. This method is a revival of the old solmization system invented by Guido d' Arezzo, but it admits the interval of the seventh, excluded by Guido. For the complicated music of modern masters the tonic sol-fa is as inadequate as Guido's solmization had been found. It also favors the system of unequal temperament, directly opposed to the fundamental principle of equal temperament, without which the achievements of modern music would have been impossible. It is of value as an educational system, since it can be taught quickly and produces better immediate results than the usual notation.

TONITE. See EXPLOSIVES.

TONK. A native Rajputana state in central India. Area, 2553 square miles. Pop., 1911, 303,181. Capital, Tonk.

TONK. The capital of the native Rajputana State of Tonk, central India, near the river Banas, 55 miles south of Jaipur (Map: India, C 3). It is defended by a mud fort and a wall. Pop., 1901, 38,641; 1911, 53,764.

TONKA, tŏn'kȧ. The Chinese name of Puket (q.v.).

TONKA BEAN; also called TONGA and TONKIN BEAN. The seed of a tall leguminous tree, *Dipteryx odorata*, found in Venezuela, Guiana, and neighboring regions. The seeds are about the size of almonds, though somewhat longer, and are covered with a shining black skin. They are very fragrant from the presence of cumarin and are used in perfumery, ground as sachet powder, and extracted with alcohol as a flavor in cookery, in tobacco manufacture, soap making, etc. The fluid extract has been used as an adulterant or cheap substitute for vanilla; but the former contains cumarin, while true vanilla contains vanillin. The native name of the tree is cumara.

TONKAWA, tŏng-kă'wȧ (from Hueco Indian *tonkaweya*, many staying together). A peculiar tribe, apparently constituting a distinct linguistic stock, originally occupying the country about the lower Colorado and Guadalupe rivers in southeastern Texas. They were noted for cannibalism. The Tonkawa roved about, built circular thatched houses, lived by hunting and wild fruits, and were at war with almost all their neighbors, by whom they were despised as man-eaters. According to their tradition they came from the south. In 1760 some of them were attached to the San Antonio missions. In 1849 they were reported to number 600 or 700, who had been driven to the upper Brazos on account of depredations among the American settlements near the coast. In the fall of 1855, with other small Texas tribes, a part of them, to the number of 170, were gathered upon a reservation on the Brazos, a few miles below Fort Belknap, but they were removed in 1895 to a new reservation on the Washita, near the present Anadarko, Okla. Here they remained until the outbreak of the Civil War, when, thinking that they were about to enter the Confederate service, other tribes took the opportunity to wipe out old scores. A force of about 200 Shawnee, Delaware, Caddo, and other Indians attacked the agency and the neighboring Tonkawa village near Anadarko in October, 1862, and killed one or two of the agency employees and 137 out of about 320 Tonkawa men, women, and children. The Tonkawa made a stout resistance and inflicted severe loss upon the enemy. The survivors led a vagrant existence in northern Texas, most of the men enlisting as scouts against the Comanche, Kiowa, and other wild tribes. In 1875 they were reported to number but 119 and were in poor condition. In 1882 they were put in charge of a special agent, who reported them as numbering then only 98. Two years afterward they were removed to a reservation in northern Oklahoma. In 1910 they were reduced to 42 and derived their principal income from the leasing of their surplus lands.

TONKS, Oliver Samuel (1874–). An American professor of art, born at Malden, Mass. He was educated at Harvard (A.B., 1898; A.M., 1899; Ph.D., 1903) and was a fellow of the American Classical School at Athens in 1901–02. In 1902–03 he served as assistant curator of the department of classical art at the Museum of Fine Arts in Boston. He was instructor in Greek at the University of Vermont in 1903–04, lecturer at Columbia in 1904–05, and preceptor in art and archæology at Princeton in 1905–11. In the latter year he became professor of art at Vassar. Besides contributing to the New International Encyclopædia, he collaborated in writing *The Art Museum and the Public School* (1912).

TONKÜNSTLER-SOCIETÄT. One of the oldest musical societies of Vienna. Founded in 1771, reorganized in 1797, in 1865 it was once more reorganized and, in recognition of the generous gifts of the composer, renamed Haydn-Societät.

TONLE SAP, tŏn'lȧ săp', or Tale Sap. A lake of central Cambodia, connected with the Mekong by an arm of that river known also as the Me-Sap (Map: French Indo-China, D 4). The lake acts as a great reservoir. During the summer monsoon the waters of the Mekong back up through the Me-Sap, bringing the length of the lake to about 120 miles; during the dry season the lake is drained by the same arm to about 80 miles in length. During high water navigation is maintained from Saigon to Battambang in western Cambodia. Approaching shores divide the lake into sections, the Caman Dai in the northwest and the Caman Tieu in the southeast.

TON MILE. See Railways.

TON'NA, Charlotte Elizabeth (Browne) (1790–1846). An English author, born at Norwich. She was twice married, first to a Captain Phelan and after his death to Lewis H. J. Tonna, an English writer. She began her literary career in Ireland, writing under the pseudonym of Charlotte Elizabeth. Her works were largely of a religious nature and evinced considerable hostility towards the Catholic church. She was connected with various magazines and wrote numerous religious tracts, novels, poems, and short stories for children. Consult *Works of Charlotte Elizabeth*, with an introduction by H. B. Stowe (3 vols., New York, 1844–45).

TONNAGE (formerly also *tunnage*, from *tun*, *ton*, from OF. *tonne*, pipe, tun, ML. *tunna*, OHG. *tunna*, Ger. *Tonne*, tun). The carrying capacity or weight of a ship expressed in tons. There are four ways of expressing it: gross tonnage, net tonnage, dead-weight tonnage (or dead-weight carrying capacity), and displacement (q.v.) tonnage. The gross tonnage of a ship is ascertained by dividing by 100 the whole interior capacity (expressed in cubic feet) of the hull of a ship and her inclosed deckhouses; this method presumes that an average cargo of light-weight freight will require not far from 100 cubic feet for each ton of actual weight. Net tonnage is derived from the gross tonnage by deducting the capacity of all spaces not used, or capable of being used, for cargo or passengers. The dead-weight tonnage is the actual weight of cargo a vessel can carry without immersing her too deeply for safety. Displacement tonnage is the weight of ship and cargo or contents when immersed to some fixed depth. For war vessels the displacement tonnage is usually given for an arbitrary condition called "at normal draft," which is assumed to be the average seagoing condition, with about two-thirds of all fuel and stores. Full-load displacement is the condition when all fuel and stores are on board. For merchant vessels the displacement is usually given for the full-load condition, i.e., when the ship is immersed to her Plimsoll mark. (See Load-Line Marks of Vessels.) In freighting ships 40 cubic feet of merchandise is considered a ton; but if that bulk exceeds 2240 pounds (or, in the United States, frequently 2000 pounds) the charge is made by weight. For merchant vessels of ordinary type the displacement is greatest, gross tonnage next, then net tonnage. Dead-weight carrying capacity is always greater than the net tonnage and is usually greater than the gross tonnage; but it is less than the full-load displacement by the weight of the ship and contents exclusive of the cargo.

Each of the great ship canals of the world has a tonnage measurement of its own upon which the laying of the tolls is based. The result so obtained is approximately the same as the net register tonnage determined by American and British rules, but there are some additions. By the rules of measurement that have been adopted for the Panama Canal all vessels except warships are required to present a certificate showing gross and net tonnages as determined by the rules under which they were measured and registered. Warships are required to furnish a curve or table of displacement from which may be derived the displacement corresponding to any mean draft. The measurement of the underdeck space is the same as is provided by the British and Suez Canal rules for vessels having double bottoms with the inner bottom horizontal; but by the American rules the double-bottom spaces intended for carriage of oil fuel and feed water are added. The space for feed water is, however, deducted from the gross tonnage independently of the allowances for engine and fire rooms. See Displacement; Measurement of Ships for Tonnage; Panama Canal; Shipbuilding.

TONNAGE AND POUNDAGE. Certain duties on wine and other merchandise, which began to be levied in England in the reign of Edward III. They were at first granted to the crown by the vote of Parliament for a limited number of years and renewed on their expiration. Originally fluctuating in amount, tonnage and poundage came to be fixed at 3s. on every tun of wine and 5 per cent on all goods imported. In the reign of Henry V they were first conferred on the King for life; and, the same course being followed with his successors, the sovereign began gradually to consider them as his proper right and inheritance, and the vote of Parliament as but a formality expressive of the popular recognition of his prerogative. It was usual to levy these duties during the period intervening between a sovereign's accession and his first Parliament, and this was done by Charles I as by his predecessors. The Commons, however, in Charles's first Parliament accorded these imposts not for life, but for a year only; and the House of Lords objecting to this departure from previous usages and rejecting the bill, an attempt was made to levy tonnage and poundage by the royal authority alone, a proceeding which aroused the opposition of the Commons. Charles was, in 1629, induced to pass an act renouncing the power of levying these or any other imposts without parliamentary sanction. On the restoration Charles II obtained a grant of tonnage and poundage for life, but by three several statutes of Anne and George I these imposts were made perpetual and mortgaged for the public debt. The duties were abolished in 1787.

TONOM'ETER (from Gk. *τόνος*, *tonos*, tone, sound, tension, strength, + *μέτρον*, *metron*, measure). An instrument for measuring tension, as of the eyeball or of the blood pressure as transmitted by the ventricles of the heart. Hamer's tonometer consists of a tube of metal, with a peg or small rod projecting and so arranged that a coiled watchspring matches its tension against the tension of the body to which the peg is pressed. Roy's tonometer consists of a tube containing oil in which a cylinder plays, carrying a registering index.

TONQUIN, tŏn-kēn'. A division of French Indo-China. See Tongking.

TÖNSBERG, tēns'bĕrg. One of the oldest towns of Norway, in the Amt of Jarlsberg and Larvik, on a fjord of the same name, 45 miles south of Christiania (Map: Norway, D 7). The seal and whale fisheries employ a large proportion of its male population. Pop., 1900, 8620; 1910, 9719.

TON'SIL. One of a pair of small ovoid bodies situated between the pillars of the soft palate, one on each side of the throat, corresponding in position with the angles of the lower jaw. The tonsil has about 12 spaces within its substance, from which smaller follicular depressions extend into its structure, and is classed with the ductless glands. It is frequently inflamed after infection by entrance of germs into the crypts and follicles described. Severe suppurative disease about the tonsil causing swelling and displacement of it is termed quinsy (q.v.). See Palate.

TONSIL, Nasopharyngeal, or Luschka's. See Adenoid.

TON'SILLI'TIS. See Pharyngitis; Quinsy.

TON'SON, Jacob (c.1656–1736). A famous London publisher. He opened his shop at the Judge's Head in Chancery Lane, near Fleet Street, in 1677. Towards the close of the century he moved to Gray's Inn Gate, taking into company with him his nephew, Jacob Tonson, and in 1710 to the Shakespeare's Head in the Strand. For Dryden Tonson published several plays, the translation of Vergil (1697), and *The Fables* (1699). He was also helped by Dryden to start the famous *Miscellanies*, of which the first appeared in 1684. With this prestige he became the popular publisher among the next generation of authors. He bought out the rights in Milton's *Paradise Lost* and from his press issued Rowe's edition of Shakespeare (1709) and Pope's in 1725. About 1700 he joined in forming the famous Kit-Cat Club, of which he was made secretary. About 1703 he bought a house at Barn Elms on the Thames and built a room for the club.

TONSTALL, Cuthbert. See Tunstall, Cuthbert.

TON'SURE (Lat. *tonsura*, a shearing, from *tondere*, to shear). A religious observance of the Roman Catholic and Oriental churches, which consists in shaving or cutting the hair as a sign of the dedication of the person to the special service of God and commonly to the public ministry of religion. Probably it first arose in reference to the monastic rather than the clerical life. Jerome disapproved of the tonsure for clerics. Paulinus of Nola, in the end of the fourth or beginning of the fifth century, alludes to it as then in use among the Western monks, and it speedily passed from them to the clergy. The form of the tonsure was different in different churches. That of the Roman church, called the tonsure of Peter, consisted in shaving the crown as well as the back of the head, so that there remained a circular ring or crown of hair. In the Scottish (or Irish) tonsure the entire front of the head was shaved, leaving the front bare as far back as the line from ear to ear. This tonsure was called the tonsure of John and sometimes of Simon Magus. The Greeks and other Orientals shaved the entire head. Originally the tonsure was merely the symbol of admission to the clerical state (see Clerk), but about the seventh century it came to be used as a distinct and independent ceremonial. Consult E. L. Taunton, *The Law of the Church* (London, 1906).

TONTI, Henri de. See Tonty, Henri de.

TONTINE, tŏn'tēn (Fr., from It. *tontina*, from Tonti). A tontine exists whenever several persons are united in a group on such terms that on the death of any member of the group certain specified advantages previously enjoyed by him are distributed among the surviving members. The principle has been employed in many kinds of transactions, of which the most important are government loans and life insurance. The application of the tontine principle to government loans began in the later Middle Ages. The idea was introduced into France about the middle of the seventeenth century by an Italian named Lorenzo Tonti, but it had already long been known in Italy and Germany. It was one of numerous devices adopted by various states to induce the public to subscribe to government loans. The first French loan on this principle was made in 1689 and the last one in 1759. Existing tontines were wound up in 1770 and life annuities substituted for their privileges. The English government made less use of tontines than the French. The earliest one was organized in 1692 and the third and last in 1789. There were a few Irish tontines in the eighteenth century. In England none of the loans was fully subscribed, though offered on favorable terms.

A subscriber to a tontine loan was the buyer of a life annuity, which increased in amount with the death of any member of the class to which the subscriber belonged. On the death of the last survivor the obligation of the government terminated. In most cases the subscribers were divided into classes according to age, the right of survivorship prevailing only among the members of the same age class. Sometimes the amount of the annuity at the beginning varied for the different classes. Thus, in the first English loan the annuity increased from class to class, being slightly over 4 per cent for those under 20 years of age and more than 5½ per cent for those over 60. Occasionally there were other limitations: the first English loan, which did not classify subscribers according to age, provided that when the number of survivors was reduced to seven the right of survivorship should cease. On the third loan it was stipulated that no single annuity should exceed £1000. Usually the subscriber to a loan had the privilege of naming any other person as the recipient of the life annuity, with the natural result that a large proportion of the annuitants were young. The feature of a tontine loan which was relied on to attract subscribers was the great return secured by those investors who lived longest.

It is obvious that a tontine loan is an unwise fiscal measure. As to ordinary life annuities, it is fairly safe for the government to assume that premature deaths will largely offset exceptionally long lives, but in the case of a tontine there is no such balancing. It is not the average duration of life of the group which determines the amount of interest which the government will have to pay, but a much more uncertain thing, the duration of the longest life.

The application of the tontine principle to life insurance has taken two forms. Under the old or full tontine plan, in use before the days of surrender values, an insured person who allowed his policy to lapse recovered nothing from the company. The gain which the company had made on his policy was put to the credit of the other insured of the same class. At the end of the tontine period all such profits were distributed among the members of the group still holding policies. After the introduction of surrender values, partly under legal compulsion and partly by the voluntary action of the insurance companies, the so-called semitontine plan was adopted. Under this there is a similar division of surplus among those members of the group whose policies are in force at the end of the tontine period, but the surplus to be divided is comparatively small. It arises chiefly from two sources—an expense rate so low that some part of the loading of the premium is saved, and an interest rate on investments higher than that assumed in calculating reserve values. A person taking out a semitontine policy enters into an agreement with the company that the profit thus arising on his policy shall be put into a pool along with the corresponding profit on other policies of the same class, and that at the end of the tontine period—usually 10, 15, or 20 years—the pool shall be divided among those members of the class whose policies are still in force.

The question of the desirability of applying the tontine principle to life insurance has been the occasion of much discussion. That the full tontine plan was a bad one cannot be questioned, but the evils arose more from the absence of surrender values than from the tontine method of distributing the surplus. For the semitontine plan the purely financial argument would seem, on the whole, favorable. In all forms of life insurance the indemnities paid on the policies of those dying early are partly at the expense of those whose policies run a longer time. The distribution of the surplus on the tontine principle is at least a partial reparation. It ought always to be clearly understood that the larger return to those whose policies are kept in force to the end of the tontine period necessarily means a smaller return to those who die or whose policies terminate before that time. The weightiest objection to tontine insurance is a moral one. It is introducing additional uncertainty into the transaction of life insurance, where the speculative element is already large.

Private tontines were by no means uncommon down to the end of the eighteenth century. They were frequently taken up to raise money for purposes requiring large investments of capital. Large buildings in many cities of the United States were erected in that way. At the present time they are almost unknown, partly because the abundance of capital has made it unnecessary to resort to them, partly because the large element of uncertainty involved in them is inconsistent with the spirit of modern business.

TONTY, or **TONTI**, tôɴ'tē', Henri de (c.1650–c.1704). A companion of La Salle (q.v.) in the exploration of the Mississippi valley. He was a native of Gaeta in Italy and at an early age entered the military service of France. In July, 1678, he went with La Salle to Quebec. In the autumn of 1679 Tonty sailed up along the eastern shore of Lake Michigan and met his chief at the St. Joseph River. In March, 1680, he was left by La Salle in command of Fort Crèvecœur in the Illinois country. Forced to flee by a mutiny among his soldiers, he made his way to Green Bay, where he passed the winter of 1680–81 and in May met La Salle at Michilimackinac. In 1682 he was with La Salle in the memorable voyage down the Mississippi, and in May of that year he was dispatched to Mackinac for supplies. In December Fort St. Louis was erected at Starved Rock on the Illinois, and Tonty was left in charge. In 1685 he took part in an expedition of the Illinois Indians against the Senecas, and in 1687 he was with Denonville in the expedition against the English colonies. In February of the preceding year he had descended the Mississippi in search of La Salle. He continued to live among the Illinois Indians till 1702, when he joined Iberville in Louisiana. Spurious memoirs were published under his name at Paris in 1697 under the title *Dernière découverte de la Salle dans l'Amérique septentrionale*. His real memoirs were published by Margry in *Origines françaises des pays d'outre-mer* (Eng. ed., New York, 1906). Consult J. C. Parish, *The Man with the Iron Hand* (Boston, 1913), and C. B. Reed, *Masters of the Wilderness* (Chicago, 1913).

TOOELE, too-ĕl'ĕ. A city and the county seat of Tooele Co., Utah, 35 miles southwest of Salt Lake City, on the San Pedro, Los Angeles, and Salt Lake and the Tooele Valley railroads (Map: Utah, B 2). There are large smelting and refining works, saw mills, a creamery, and a flour mill. Tooele has a Carnegie library. Pop., 1900, 1200; 1910, 2753.

TOOKE, took, JOHN HORNE (1736–1812). An English etymologist and politician. He was born in London, his father being John Horne, a poulterer. He was educated at Westminster and Eton and at St. John's College, Cambridge. He entered the Church strongly against his own wish and in 1760 became curate at New Brentford. In 1763 he traveled in France for a year as the tutor of the son of John Elwes, and two years later, while acting again as a tutor, he met John Wilkes (q.v.) and visited Voltaire (q.v.) at Ferney. When Wilkes stood as a candidate for the County of Middlesex in 1768, Tooke zealously aided him, but the pair afterward quarreled. Tooke still, however, continued to meddle in political affairs and ventured to encounter Junius, with whom some have even sought to identify him. In 1773 he resigned his living at New Brentford and, besides continuing his legal studies, commenced the study of philology. About this time he rendered some important private service to William Tooke of Purley in Surrey, who intended to make him his heir. In consequence he adopted in 1782 the surname of Tooke, by which he is now known. In 1777 he was fined and imprisoned for having published in 1775 an advertisement in which he accused the King's troops of barbarously murdering the Americans at Lexington. While in prison he penned his celebrated *Letter to Mr. Dunning* (dated April 21, 1778), in which are to be found the germs of his *Diversions of Purley*. On his release Tooke made repeated attempts to gain admission to the bar, but was refused on the ground of his clerical orders. Afterward he returned to political writing, and in a *Letter on Parliamentary Reform* advocated universal suffrage. In the struggle between Pitt and Fox he wrote pamphlets on the side of the former, but soon got to hate Pitt, as he had learned to hate many other public men. In 1786 appeared the first volume of his famous *Epea Pteroenta, or the Diversions of Purley*, vol. ii (1805), a work on the analysis and etymology of English words. As a philologist Tooke was among the first to realize the necessity of studying Gothic and Anglo-Saxon. But his passion for politics soon drew him from literature into public life, and in 1801 he entered Parliament for the borough of Old Sarum; but he made no figure there. The best edition of the *Diversions of Purley* is that of Taylor (London, 1840). Consult Alexander Stephens, *Memoirs of John Horne Tooke* (2 vols., London, 1813), and J. A. Graham, *Memoir of John Horne Tooke* (New York, 1898).

TOOKE, THOMAS (1774–1858). A British economist. He was born in St. Petersburg. In 1804 he became partner in a prominent Russian house in London; later he became director of the Royal Exchange Assurance Corporation, president of the Calhamie Dock Company, member of the managing board of the London and Birmingham Railway. He was a member of the first great factory commission and president of the commission appointed to inquire into the evils of child labor in factories. From his practical experience in the Russian trade Tooke developed a strong antipathy to governmental interference in foreign commerce. He was author of the *Merchants' Petition in Favour of Free Trade*, presented to Parliament in 1820. He was chiefly interested, however, in questions relating to money and banking. In these subjects he is regarded as one of the best authorities of the times. He was the leading opponent of the quantity theory of money and was a harsh critic of Paul's Banking Act of 1844. He was author of several works on currency problems, of which the most important are his *On the Currency in Connection with the Corn Trade, and on the Corn Laws* (1820); *Considerations on the State of the Currency* (1826); *An Inquiry into the Currency Principles and the Connection of the Currency with Price* (1844); *A History of Prices, 1793–1856* (1838–57), six volumes, the last two written in collaboration with W. Newmarch.

TOOKE, WILLIAM (1744–1820). An English historian, born at Islington, London, and educated there at an academy. Taking holy orders in 1771, he became chaplain to the English church at Kronstadt in Russia and three years later chaplain to the English merchants at St. Petersburg. Coming into possession of a fortune, he resigned in 1792 and returned to London, where he devoted the rest of his life to literature. His most valuable work was in Russian history, based upon research in the Imperial Library at St. Petersburg. It embraces mainly *The Life of Catharine II*, partly a translation from the French (1798); *A View of the Russian Empire during the Reign of Catharine II and to the Close of the Present Century* (1799); *A History of Russia from the Foundation of the Monarchy by Rurik to the Accession of Catharine II* (1800). He published numerous miscellaneous books, as *The Loves of Othniel and Achsah* (1769), a Chaldee romance; *Varieties of Literature* (1795); *Lucian of Samosata*, from the Greek, with the comments of Wieland and others (1820). His son, WILLIAM TOOKE (1777–1863), took a prominent part in founding University College, London, and also the Society for the Diffusion of Useful Knowledge. He was also a member of the Royal Society and president of the Society of Arts. He edited the poems of Churchill, compiled *The Monarchy of France* (1855), and published a volume of verse.

TOOLE, JOHN LAWRENCE (1830–1906). An English comedian, born in London. He made his début in London at the Haymarket Theatre in 1852. Upon the opening of the new Adelphi Theatre by Benjamin Webster in 1858, Toole became the leading comedian, and there, in 1862, he appeared in his great part of Caleb Plummer, in Boucicault's dramatization of *The Cricket on the Hearth*. In 1868 he played the

Artful Dodger at the Queen's Theatre, with Henry Irving as Bill Sykes. He visited America in 1875 and in 1890 made a successful trip to Australia. He opened Toole's Theatre (the Folly Theatre reconstructed) in February, 1882, and managed it as a home of comedy for a number of years. Consult: Toole's *Reminiscences*, chronicled by Joseph Hatton (London, 1888); Matthews and Hutton, *Actors and Actresses of Great Britain and the United States* (New York, 1886); Scott, *The Drama of Yesterday and To-Day* (London, 1899).

TOOMBS, Robert (1810–85). An American statesman, born at Washington, Ga. He studied at the State University at Athens and graduated (1828) at Union College, Schenectady, N. Y. He studied law at the University of Virginia and began practice in Wilkes Co., Ga. After service against the Creeks in 1836 and several years in the Georgia Legislature as a States' Rights Whig, he was elected to Congress in 1844 and held his seat for four terms, until 1853, when he was elected to the United States Senate and in 1859 reëlected. He opposed the Mexican War and the annexation of territory by force, aided in the adoption of the Compromise of 1850, opposed the Nashville Convention, and helped secure the famous Georgia Platform. As an impassioned political speaker he had few equals. The movement of secession had his full approval; and it was chiefly his influence, in opposition to the more conservative views of his lifelong friend, Alexander H. Stephens, that led his State to pass its ordinance of secession, to which there was a strong opposition, especially among the old line Whigs. On the election of Davis Toombs was offered the office of Secretary of State and with reluctance accepted it for a short time, on his resignation receiving a commission as brigadier general. He served in the second battle of Bull Run and at Antietam and later was made brigadier general of the Georgia militia. After the war he lived for some time abroad; then from 1867 he carried on a successful law practice at his old home, being especially serviceable to Georgia by winning his contention that railroads should pay taxes like other property. He was noted for his brilliant wit, his legal sagacity, and his benevolence. He opposed the Reconstruction measures and never took the oath of allegiance. He is mainly remembered as an unrelenting Southern partisan. Consult: W. P. Trent, *Southern Statesmen of the Old Régime* (New York, 1897); U. B. Phillips, *The Life of Robert Toombs* (ib., 1913); W. W. Hicks, *Tributes and Memories* (Boston, 1914).

TOON (Hind. *tūn*, *tun*, from Skt. *tunna*, toon), or Toona (*Cedrela toona*). A tree of the family Meliaceæ, one of the largest timber trees of India, occurring also in Australia, where it attains a height of 150 to 180 feet and a diameter of 5 to 7 feet. Hooker mentions one which he measured in India which was 30 feet in girth at 5 feet above the ground. The flowers are used in India for dyeing. The tree, sometimes called bastard cedar, occurs at 4000 feet on the Himalaya and is found in the farthest south of the East Indies. The bark contains considerable tannin and is used to produce a kind of purplish leather. The wood is soft, durable, easily worked, and extensively used in housebuilding and for furniture. The timber called in English markets Maulmain cedar is exported from India in considerable quantities.

TOOROP, tō̆′rŏp, Jan (1860–). A Dutch East Indian painter, of Norwegian, Dutch, and Javanese ancestry. He was born at Porworedjo (Java), was educated at Batavia and in Delft, Holland, and after 1881 studied art at the academies of Amsterdam and Brussels and also in London and Paris. In the latter city he joined the post-Impressionist movement and after his return to Brussels helped to found the radical Société des Vingt. Later he introduced the new phase of art into Holland. The brutal realism, power, and strength of his early work are well illustrated in his "Broeck-in-Waterland," "The Wave," and "Melancholy." Afterward his ideas became more intricate and mystically symbolical. His treatment of line, though archaic, is masterly, and he often displays great decorative skill and delicacy of handling. Characteristic examples of his later manner are: "The Sphinx"; "The Three Brides"; "Our Time"; "With the Sower"; "Nirvana"; "Rustic Trinity." He also painted many dainty portraits of children and produced lithographs and etchings.

TOOTH. See Teeth.

TOOTHACHE TREE. See Aralia; Zanthoxylum.

TOOTH-BILLED PIGEON. An extraordinary member of the pigeon tribe (*Didunculus strigirostris*), native to Samoa and alone representing a separate family (Didunculidæ). This species, known to the Samoans as *manu-mea*, or redbird, is about 1 foot long and glossy greenish black, with a chestnut tinge on the upper parts and brown on the wing quills and abdomen. Its most striking characteristic is a great orange-colored, hawklike, toothed bill, suitable for gathering the bananas and other large fruits upon which it lives. It was originally wholly terrestrial in its habits, spending its time on the wooded mountain sides, where it roosted on rocks and stumps and nested on the ground, rarely gathering into parties. It was hunted for food. This circumstance, the fact that it laid but a single egg, and the introduction by white settlers of cats, rats, and guns led not only to its speedier destruction, but to an interesting change in habits, since it soon resorted much more to tall trees than previously and placed its nest on high branches. See Plate of Pigeons.

TOOTH FUNGI. See Basidiomycetes.

TOOTH SHELL. See Tusk Shell.

TOPALIAS, Lake. See Bœotia.

TO′PAZ (Lat. *topazion*, *topazus*, from Gk. *τοπάζιον*, *τόπαζος*, topaz; possibly connected with Skt. *tapas*, heat). A mineral aluminium fluosilicate, crystallized in the orthorhombic system. It has a vitreous lustre and may be colorless, yellow, green, blue, or red. Topaz occurs in gneiss or granite associated with beryl, mica, tourmaline, etc., and occasionally with apatite, cassiterite, and fluorite, and also in certain talcose rocks, mica slate, rhyolite, and in alluvial deposits and drift. The crystallized varieties, owing to their hardness, are valued as gems, and the best of these come from Ceylon and other parts of India, the Urals, Minas Geraes, Brazil, and in the United States from various localities in Maine, Colorado, and Utah. The most popular color for topaz gem stones is a rich orange yellow somewhat resembling the color of sherry wine. Rose topaz is a delicate rose pink in color. The name "topaz" was applied by Pliny and others to yellow crystals, probably chrysolite. Among the ancients it was regarded as symbolical of friendship; when worn as an amulet it was said to drive away sadness, strengthen the intellect, and bestow courage; mounted in gold and hung around the neck, it dispelled enchantment. It is the birthstone of November. The true Oriental topaz is the yellow sapphire, and the Saxon, Scottish, Spanish, smoky, and false topaz are yellow varieties of quartz. See GEMS.

TOPE, tōp (Hind. *tōp*, from Pali, Prak. *thūpa*, from Skt. *stūpa*, mound, accumulation). The vernacular name of Buddhistic monuments, in the form of tumuli, intended for the preservation of relics or as memorial mounds commemorating some religious event. In Ceylon they are called dagabas; the designation more generally employed by Indian archæologists is stupa, from the Sanskrit, of which tope is merely a dialectic corruption. Not only the Buddhists erected these monuments, but the Jains, their rival sect, did likewise. No Jain specimen appears to have been preserved. The oldest topes are in the form of a hemisphere or sometimes an ellipse, solidly constructed of brick, stone, and masonry, resting on a base similarly constructed and surrounded by a stone railing, which was modeled after a prototype of mud and served to mark off the processional path for the worshipers to follow in circumambulating the mound. The domical stupa has been thought to owe its shape to an original earthen tumulus, but it may have been derived from the curved roof of bamboos built over a primitive circular hut shrine constructed of perishable materials. (Cf. V. A. Smith, *History of Fine Art in India.*) The elevation of the dome tended in course of time to rise higher and higher until gradually it assumed a tower-like form and was even further developed in the Chinese pagoda. In the case of the tope the cupola is crowned by a small structure generally quadrangular, but sometimes in the shape of a reversed stepped pyramid, over which is a roof shaped like an extended parasol. Sometimes there are several parasols, and their multiplication and varied arrangement led to variations of form in the tope itself. This was in many cases made of pyramidal form, especially in China, where the superposed stories took the form of a tower and the cupola type wholly disappeared; while the topes of the Mongols, the ssuvurghans, are pyramids erected on a low quadrangular base. The top of the pyramidal topes always carries some metal ornament, frequently gilt, resembling a parasol, a needle, a trident, or a rising flame. The height of these buildings varies from a few feet to 300; while the circular Abayagiri tope in Ceylon is 360 feet in diameter. If erected in a cave temple, the tope generally stands at the end of a long hall especially cut out for it, but sometimes also in the sanctuary of the cave temple itself; if erected overground, it stands always in the vicinity of a temple or convent.

In the interior of the tope is the cell or chamber (*dhâtugarbha*) containing the box of relics with their accompanying "seven precious things"—gems, gold, silver, coral, etc. The box itself generally consists of an outer case of stone, clay, or bronze, which incloses a silver cylinder, and within this a golden cylinder containing the relics, both bearing commemorative inscriptions. In some cases the relics were placed not within but under the tope. The cupola form represents the water bubble, the Buddhistic symbol of the hollowness of mundane existence, while the parasol is the emblem of the royal dignity possessed by a Buddhistic saint. The number of stories in topes of pyramidal or tower-like form had likewise a symbolical import. Thus, only the topes of the most accomplished Buddhas had 13 terraces, to show that these Buddhas had passed beyond the 12 causes of existence; three terraces imply the three worlds of desire, of form, and of absence of form; five, the steps of Mount Meru; and so on.

The topes generally occur in groups, of which the most important is the Bhilsa group in Central India, to which belongs the famous Sanchi tope, and near it are two minor groups, at Sonari and Satdhara. In Bengal is that of Sarnath, 128 feet high. The great tope at Amravati is the most interesting for the wealth and beauty of its sculptures. Others are at Gandhara, Telelabad, and Menikalya, and in Ceylon at Tuparamaya, Ruanwalli, Abayagiri, Anuradhapura, etc. In 1909 near Peshawar was discovered the ruins of a famous stupa erected by King Kanishka (c.1 A.D.) containing in a reliquary casket a part of Buddha's remains, which have since been ceremoniously transferred to Burma. The sculptured rails are described under INDIAN ART. Consult: Koeppen, *Die Religion des Buddha* (Berlin, 1857); James Fergusson, *History of Indian and Eastern Architecture* (London, 1876); A. Foucher, *L'Origine grecque de l'image des Buddha* (Paris, 1913).

TOPE. A small European shark (*Galeorhinus galeus*). It is represented on the Western American coast by the so-called oil or soup-fin shark (*Galeorhinus zyopterus*), about 6 feet long and gray with black-edged dorsals. The name is also given to the related small dog shark (*Mustelus canis*) of the North Atlantic. See Plate of LAMPREYS AND DOGFISH.

TOPE'KA. The capital of Kansas and the county seat of Shawnee County, 65 miles west of Kansas City, on the Kansas River and on the Missouri Pacific, the Union Pacific, the Atchison, Topeka, and Santa Fe, the Leavenworth and Topeka, and the Chicago, Rock Island, and Pacific railroads (Map: Kansas, G 4). It is situated on rolling prairie land, at an elevation of over 800 feet, and covers an area of about 16 square miles. Beautiful shade trees and handsome residences add to the city's attractiveness. The most notable structures are the State Capitol and the Kansas Memorial Building, both in the heart of the city. Other noteworthy edifices are the public library (containing 32,000 volumes), the United States government building, the State printing plant, State museum, the county courthouse, and the city hall and auditorium. The Melan Arch Bridge possesses considerable architectural merit. Topeka is the seat of Washburn College (Congregational), opened in 1865, and of the College of the Sisters of Bethany (Protestant Episcopal), opened in 1861. The State Insane Asylum and the State Reform School are also here. The prominent local charitable institutions include the Provident Association, the Santa Fe Railway Hospital, the St. Francis Hospital, the Jane C. Stormont Hospital and Training School for Nurses, Christ Hospital, Detention Hospital, the Methodist Old Peoples' Home, and Ingleside, a home for aged women.

The industrial interests are centred chiefly in the extensive shops of the Santa Fe Railroad and in the manufacture of flour and butter. Of the smaller establishments the most important are foundries and machine shops, lumber mills, and manufactories of boilers, trusses, woolen goods, etc. The 1914 census showed the total capital invested in all industries to be $14,186,000; the value of their output amounted to $19,742,000. Considerable wholesale and jobbing business is carried on in Topeka. The commission form of government was adopted in 1910. The electric-light plant and the water works are owned by the municipality. The city spent in 1913 for maintenance and operation $581,000, the chief items being: schools, $251,000; interest of debt, $114,000; streets, $35,000; fire department, $63,000; and police department, $31,000. Pop., 1900, 33,608; 1910, 43,684; 1915 (State census), 46,747.

Topeka, laid out in 1854, was one of the Free State towns founded by Eastern antislavery men immediately after the passage of the Kansas-Nebraska Bill. In 1856 an antislavery convention adopted here the Topeka Constitution, in pursuance of which the Topeka government was established, to be soon broken up by the United States troops. During this year Topeka became notorious for the raids made by its citizens on proslavery settlements. In 1857 Topeka was chartered as a city, becoming a city of the first class in 1881. It was made the capital of the State in 1861. Consult: Giles, *Thirty Years in Topeka: A Historical Sketch* (Topeka, 1886); Z. L. Potter, *Industrial Conditions in Topeka* (New York, 1915), and D. O. Decker, *Municipal Administration in Topeka* (ib., 1915), both published by the Russell Sage Foundation.

TOPELIUS, tô-pā′lē-ụs, Zacharias (1818–98). A Swedish-Finnish poet and novelist, born at Kuddnäs, near Ny Karleby. He was educated at the University of Helsingfors, where, after gaining the doctorate (1847), he was professor of the history of Finland and the North from 1853 to 1878. As a lyric poet he was second only to Runeberg, and his children's stories have been translated into many languages. His publications include: *Ljungblommor* (Flowers of the Heath, 3 parts, 1845–54); *Efter femtio år* (After Fifty Years, 1851), a play; *Fältskärns Berättelser* (Tales of an Army Surgeon, 5 vols., 1853–67); *Läsning för Barn* (Children's Stories, 8 parts, 1865–96); *Boken om vårt land* (1875; 9th ed., 1899); *En resa i Finland* (A Journey in Finland, 2d ed., 1885); *Blad ur min tänkebok* (1898; 3d ed., 1900). His collected works were published at Stockholm, 30 vols. (1899–1910).

TOPETE Y CARBALLO, tô-pā′tā ē kär-bä′-lyô, Juan Bautista (1821–85). A Spanish admiral and politician, born at San Andrés de Tuztla, Mexico, son and grandson of Spanish admirals. He entered the navy at the age of 17 and became midshipman in 1843 and lieutenant two years later. From 1846 to 1849 he served in Cuban waters and subsequently was on duty in the Mediterranean. He was promoted to the captaincy of a frigate in 1857 and during the war with Morocco in 1859 was chief of staff to the fleet. About this time he formed political affiliations with the Union Liberal party under O'Donnell and in 1862 was elected to the Cortes from Cadiz. He was on the Pacific station during the conflict with Peru and Chile in 1865–66 and was severely wounded in the bombardment of Callao in May of the latter year. Made brigadier on his return and placed in command of the port of Cadiz, he took an active part in the political conspiracies of the times and by his pronunciamiento of Sept. 17, 1868, gave the signal for the outbreak of the revolution which drove Isabella II from the throne. He sent a ship to bring back the generals who had been deported to the Canaries (see Spain) and after he had been joined by Prim and Sagasta won over the city of Cadiz to the revolution. In the provisional government Topete assumed the portfolio of Marine. He favored the election of the Duke of Montpensier to the throne and laid down his post when the choice fell upon Amadeus of Savoy. In 1872, however, he resumed office under Serrano and during the latter's absence from the capital presided over the Ministerial Council. In the revolution of 1873 he was imprisoned for a short time, but regained influence under the presidency of Serrano, who placed him once more at the head of the navy. With Serrano he fought against the Carlists in the north. On the accession of Alfonso XII Topete retired from active participation in politics. In 1879 he was made a life Senator and in 1881 became vice admiral. His services were rewarded with grand crosses in many orders. He died at Madrid, Oct. 29, 1885.

TÖPFFER, tẽpf′ẽr, Rodolphe (1799–1846). A Swiss novelist and draftsman, born in Geneva, son of the landscape and genre painter Adam Töpffer (1766–1847), under whose instruction he devoted himself to art. His eyesight failing, he took up teaching in 1825, established a boarding school, and in 1832 became professor of æsthetics at the Academy of Geneva. His novel *Le presbytère* (1839) attracted universal attention. *The Nouvelles genevoises* (1838), *Nouvelles et mélanges* (1840), *La bibliothèque de mon oncle* (1843), and *Rose et Gertrude* (1845) are hardly less delightful than the humorous sketches of travel, *Voyages en zigzag* (1848) and *Nouveaux voyages en zigzag* (1853), illustrated by himself. A little archaic in style, his work is simple, artistic, sound, and witty, with a childlike fancy and sentiment. Among his best productions are the seven little novels in pictures: *Mr. Jabot, M. Crépin, M. Pencil, Le docteur Festus, Histoire d'Albert, Les amours de M. Vieux-Bois,* and *M. Cryptogame*, published together in *Collections des histoires en estampes* (Geneva, 1846–47). Consult Georg Glöckner, *Rodolphe Töpffer: sein Leben und seine Werke* (Zerbst, 1891), and Hermann Wolterstoff, *Essai sur la vie et les œuvres de Rodolphe Töpffer* (Magdeburg, 1894).

TOPHET, tō′fĕt (Heb. *tōpheth*). A place in the valley of Hinnom, south of Jerusalem, associated with the worship of Molech (2 Kings xxiii. 10; Isa. xxx. 33; Jer. vii. 31–32, xix. 6, 12–14). It is probably a loan word of Aramaic origin, *tephath*, meaning "fireplace," given a pronunciation *topheth*, to suggest *bosheth* (shame). See Hinnom, Valley of; Molech.

TOPHI. See Concretion.

TOPI, Tantia. See Tantia Topi.

TOPINARD, tō′pē′när′, Paul (1830–1911). A French anthropologist, born at Isle-Adam (Seine-et-Oise). He spent 10 years in the United States, returned to study medicine in Paris, and established himself there in 1869, but after 1871 gave up his practice in order to study anthropology under Broca. He became curator for the Société d'Anthropologie in 1872, assistant director of the anthropological laboratory in the Ecole des Hautes Etudes, professor in the school of anthropology (1876), and secretary general of the Société d'Anthropologie after Broca's death in 1880. He also succeeded Broca as editor of the *Revue Anthropologique,* was commissioner for the section of anthropology at the Exhibition of 1889, and in that year was admitted to the Legion of Honor. His publications include: *Etude sur la taille considérée suivant l'âge, le sexe, l'individu, les milieux et les races* (1865); *Etude sur les races indigènes d'Australia* (1872); *L'Anthropologie* (1876); *Des anomalies de nombre de la colonne vertébrale chez l'homme* (1877); *Eléments d'anthropologie générale* (1885); *Science et foi—l'anthropologie et la science sociale* (1900).

TOP′INISH. See SHAHAPTIAN STOCK.

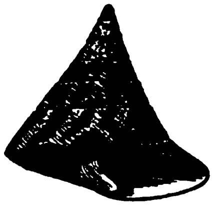
TOP′LADY, AUGUSTUS MONTAGUE (1740–78). A clergyman of the Church of England. He was born at Farnham, Surrey, and was educated at Westminster School and Trinity College, Dublin (B.A., 1760). He was ordained priest in 1764 and became rector of Broad Hembury in 1768. In 1775 failing health necessitated his removal to London, where he died of consumption, Aug. 14, 1778. He was the great champion of Calvinism in the Church of England and wrote much against the Methodists, with vigor of language and argument, but often with undue asperity of style. He is best known as the author of the popular hymn "Rock of Ages, Cleft for Me" (1775). He edited for several years the *Gospel Magazine.* His controversial works, mostly in reply to Wesley, are numerous. The best was *The Historic Proof of the Doctrinal Calvinism of the Church of England* (1774). His works were published with memoir (6 vols., 1794; 2d ed., 1825); the best edition of his poetry is by D. Sedgwick (London, 1860). Consult Thomas Wright, "Augustus Toplady and Contemporary Hymn-Writers," in *Lives of British Hymn-Writers,* vol. ii (ib., 1911), containing a bibliography.

TÖP′LER, tĕp′lẽr, AUGUST (1836–1912). A German physicist. He was born in Brühl on the Rhine, was educated in Berlin, and after various minor appointments became professor at the Polytechnic School in Riga in 1864 and in 1868 professor of physics in Graz, where he built the Physical Institute. In 1876 he was called to the professorship of physics in the Polytechnic Institute in Dresden, a position which he filled until 1900. He devised numerous forms of apparatus, especially in connection with optical and electrical phenomena. The electrical machine and the vacuum pump that bear his name are perhaps the best known of his inventions. Besides numerous papers he wrote *Optische Studien nach der Methode der Schlierenbeobachtung* (1865).

TÖP′LITZ, tĕp′lĭts. A town of Austria. See TEPLITZ.

TOP MINNOW. One of the minnows of the extensive genus *Gambusia.* They are small viviparous fishes inhabiting still waters in the Southern States, Mexico, and Cuba and keeping near the surface of the water. See MINNOW, and Plate of KILLIFISHES AND TOP MINNOWS.

TOP SHELL. A mollusk of the scutibranchiate family Trochidæ, so called because the shell, when reversed, often presents a striking similarity in shape to a boy's top. When ground and polished they are extremely beautiful and are largely used as ornaments. The operculum is horny, circular, multispiral, and has a central nucleus; and these operculæ were formerly highly valued in the East to serve the purpose of an artificial eye. These mollusks dwell in great numbers and variety along all weedy coasts and feed upon marine herbage.



TOP SHELL (*Trochus niloticus*).

TOPSY. A young slave girl in *Uncle Tom's Cabin.*

TORAH, or **THORAH,** tō′rȧ (Heb. *ha-tōrāh,* law, direction, Babylon. *tertu,* oracle, divine revelation). The Hebrew term technically applied to the Pentateuch. Besides the term Torah there is also used *Tōrath Mōshe,* i.e., Law of Moses, on the basis of the tradition which ascribes the whole Pentateuch (the historical as well as the legal portions) to Moses. Traces of the original sense of Torah as oracle are to be found in various passages of the Old Testament. Consult Haupt, "Babylonian Influence in the Levitic Ritual," in the *Journal of Biblical Literature,* vol. xix (Boston, 1900), and Zimmern, *Beiträge zur Kenntnis der babylonischen Religion* (Leipzig, 1896–1900).

TORBANEHILL (tôr′ban-hĭl′) **MINERAL.** See TORBANITE.

TORBANITE, tôr′ban-īt, TORBANEHILL MINERAL, or BOGHEAD COAL. A dark-brown variety of cannel coal found at Torbanehill, near Bathgate, Scotland. It contains over 60 per cent of volatile matter and is extensively used for the extraction of burning and lubricating oils, paraffin, and illuminating gas.

TOR′BERT, ALFRED THOMAS ARCHIMEDES (1833–80). An American soldier, born at Georgetown, Del. He graduated at West Point in 1855. He took part in the Peninsular campaign, and in August, 1862, became commander of a brigade of the Sixth Corps, which he led during the campaigns of northern Virginia and Maryland, participating in the second battle of Bull Run and in the battles of South Mountain and Antietam. He was commissioned brigadier general of volunteers in 1862 and by his gallantry at Gettysburg earned the brevet of major in the regular army. In April, 1864, he was transferred to the cavalry and was placed in command of the First Division of the Army of the Potomac. He commanded at Hanovertown, Winchester, Kearnysville, Milford, Luray, Mount Crawford, Gordonsville, and elsewhere. He was brevetted major general of volunteers in 1864 and in the regular army in 1865. He was mustered out of the volunteer service in 1866 and resigned his commission in the regular army. In 1869 he became United States Minister to the Central American States, in 1871 went as Consul General to Havana, Cuba, and in 1873 was transferred as Consul General to Paris. This last office he held until 1878. He was drowned in a wreck off Cape Canaveral, Fla.

TORCELLO, tôr-chĕl′lō. A small town and island in the lagoon of Venice, Italy, 6 miles northeast of Venice. The seventh-century Byzantine cathedral, Santa Maria, has a gorgeous twelfth-century mosaic representing biblical scenes. The Santa Fosca Church is also architecturally interesting. There are two small museums of antiquities. Pop., 1911, 147.

TORCH DANCE. Specifically a ceremony held at certain European courts, especially that of Prussia, upon the marriage of any member of the ruling house. Ministers of state and privy councilors take part as well as members of the royal family. A striking feature is a march or procession by the bride and bridegroom accompanied by their relatives and led by the ministers and councilors, in pairs, all carrying lighted wax candles. The rite is probably a survival from the early fire-worship ceremonials, which appeared in Europe during the Middle Ages.

TORCHON. See LACE.

TORCH RACE. See LAMPADEPHORIA.

TORDENSKJOLD, tôr′den-shōld, PETER (1691–1720). A Norwegian-Danish naval officer and national hero. He was born at Trondhjem, his family name being Wessel. Appointed a lieutenant in the royal navy in 1711, he proved to be a most successful scout and harrier of the Swedish coast. Later, in command of a sloop of war of 20 guns, he was equally successful, never hesitating to attack, and either capturing the enemy or escaping by excellent seamanship. In 1716 he was given noble rank under the title of Tordenskjold (thunder shield). Later in the year, with only seven ships, he captured and destroyed the Swedish fleet of 44 ships in the Dynekil, thus compelling Charles XII to raise the siege of Fredrikshald. He was then only 25 years old. After becoming rear admiral in 1718, he captured Marstrand and partially destroyed the principal Swedish squadron and was then made vice admiral (1719). In 1720 he was killed at Hanover in a duel with Col. J. A. Staël von Holstein, who had been in Swedish service. For nearly 200 years principal vessels of the Danish and Norwegian navies have borne his name.

TORDESILLAS, tôr′dā-sēl′yās, CONVENTION OF. See DEMARCATION, LINE OF.

TORELL, tō-rĕl′, OTTO MARTIN (1828–1900). A Swedish naturalist, born at Varberg. He studied medicine and the natural sciences at Lund, where he gained the doctorate (1853), and then traveled through Scandinavia, Switzerland, and Iceland engaged in scientific investigation. In 1858 and in 1861 he accompanied Nordenskiöld to Spitzbergen. In 1866 he was appointed professor of zoölogy and geology at Lund. From 1870 to 1897 he was chief of the Swedish Geological Survey. His map of Sweden ranks with the best that have been made. Besides many papers on the Ice age and upon animal life in northern Europe and North America, he wrote an account of the Swedish expeditions to Spitzbergen of 1861, 1864, and 1868. He traveled through most of the European countries and in North America.

TORELLI, tō-rĕl′lē, ACHILLE (1844–). An Italian dramatist, born at Naples. Of his numerous works, many of Goldonian imitation in the Neapolitan dialect, the best is *I mariti* (1867). In 1878 he was made director of the San Carlo Theatre at Naples, and later librarian of the library of San Giacomo.

TORELLI, GIUSEPPE (c.1660–1708). An Italian violinist and composer, one of the earliest masters of the *Concerto grosso* (q.v.). He was born in Verona. This form of music remained in favor until the time of Handel and prepared the way for the modern symphony. With Corelli, Torelli was the principal musician of his time. He became connected with the church of San Petronio at Bologna (1685), joined the Accademia Filarmonica of that city, and in 1698 was concert master to the Margrave of Brandenburg. In 1701 he returned to Bologna, where he died.

TORELLI-TORRIANI, -tôr′rē-ä′nē, MARIA (1846–). An Italian novelist, born at Novara. Under her pseudonym, Marchesa Colombi, she published many tales of "veristic" sentimentalism, of which *La gente per bene* (1877) and *In Risaia* (1877) are typical.

TO REMAIN BIBLE. See BIBLE, CURIOUS EDITIONS OF.

TORENO, tō-rā′nō, FRANCESCO DE BORJA QUEIPO DE LLANO Y GAYOSO, COUNT OF (1840–90). A Spanish statesman. He held various portfolios, was twice President of the Chamber of Deputies, effected many important reforms in matters concerning scholarship, the historical archives, and public works, and was frequently consulted by the three sovereigns under whom he served.

TORENO, JOSÉ MARÍA QUEIPO DE LLANO RUIZ DE SARAVIA, COUNT OF (1786–1843). A Spanish statesman and historian, father of the above-mentioned Count of Toreno. He had much to do with framing the constitution of 1812, held various portfolios during the minority of Isabella II, and was for a while Prime Minister. His principal work is the *Levantamiento, guerra, y revolución de España* (1836–38), which appears in vol. lxi of *Biblioteca de autores españoles*, where it is preceded by a life of the author by Antonio de Cueto.

TORFÆUS, tôr-fē′ŭs, THORMODUS, or THORMODR TORFASON (1636–1719). An Icelandic antiquary. He was born at Engö, Iceland, was educated at the University of Copenhagen, and in 1662 returned to Iceland by command of Frederick III to collect saga manuscripts. In 1667 he was appointed royal antiquary and in 1682 royal historiographer for Norway. He translated several Icelandic works into the Danish language and was the author of *Historia Vinlandiæ Antiquæ* (1705), *Grœnlandia Antiqua* (1706), and *Historia Rerum Norvegicarum* (4 vols., 1711).

TORGAU, tôr′gou. A fortified town of the Province of Saxony, Prussia, on the left bank of the Elbe, 31 miles east-northeast of Leipzig (Map: Germany, E 3). The castle of Hartenfels (1481–1544), one of the largest Renaissance edifices in Germany, was once the residence of the electors of Saxony. It is now used as barracks. There is a museum of Saxon antiquities. Gloves, glass, druggists' sundries, cigars, and biscuits are manufactured. Frederick the Great here defeated the Austrians in 1760. Pop., 1900, 11,807; 1910, 13,493.

TORIES. See LOYALISTS; WHIG AND TORY.

TORII, tō′rē-ē (Jap., bird rest, or, less probably, gateway). An archway formed by two upright posts and two horizontal beams, placed before the Shinto shrines in Japan. It is supposed that the Torii was originally a perch for sacred fowl who were to herald the approach of day.

TORLO′NIA. A princely Roman family. Its founder, GIOVANNI TORLONIA (1754–1829), was a poor cicerone of Rome, who grew enormously rich in manipulating assignats during the French Revolution and as banker for many kings and princes. He was made a grandee of Spain, and Duke of Bracciano by the Pope. His three sons married into the highest families, the eldest succeeding to the dukedom, the youngest, ALESSANDRO, becoming Prince of Civitella-Cesi and Duke of Ceri, and acquiring immense wealth, of which he made charitable use. He acquired fame by successfully draining Lake Celano (Fucino), thereby restoring to cultivation 36,000 acres of land.

TOR′MENTIL (Fr. *tormentille*, from ML. *tormentilla*, *tormentella*, tormentil, from Lat. *tormentum*, torment). A popular name for *Potentilla tormentilla*, formerly called *Tormentilla officinalis*, common on European moors and heaths. Its large woody roots have been used as an astringent and for staining leather. It also supplies material for a red dye sometimes used in Lapland. The leaves are ternate, the leaflets lanceolate and inciso-serrate, the stems ascending and forking, the flower stalks axillary and terminal, and the flowers yellow.

TORNA′DO. See WIND.

TORNEÅ, tōr′nē-ō. A town in the Government of Uleåborg, Finland, Russia, situated on the Torneå, near the north end of the Gulf of Bothnia (Map: Russia, B 1). Pop., 1910, 1716. About 33 miles north is the mountain of Avasakra (1573 feet), which is visited by many tourists at the summer solstice, when the sun is visible continuously for almost two days.

TORNEÅ. A river, forming the boundary between Russia and Sweden. It rises in the Torneå Lake near the Norwegian boundary and flows southeast through Sweden, then south on the Russian boundary, entering the Gulf of Bothnia after a course of 250 miles (Map: Sweden, G 3). Near its mouth is the town of Torneå (q.v.). Its chief tributary, the Muonio, forms the northern part of the boundary.

TORO, tō′rō. An ancient town of Spain, in the modern Province of Zamora in León, on the right bank of the Duero, 38 miles southwest of Valladolid, on the Medina del Campo-Zamora Railroad (Map: Spain, C 2). It contains numerous religious houses and palaces, most of which have been allowed to fall into a state of decay, and the collegiate church of Santa María la Mayor, dating from the reign of Alfonso VII. There are brandy distilleries, vineyards, tanneries, and woolen manufactories. Pop., 1900, 8187; 1910, 8288.

TÖRÖK-SZENT-MIKLÓS, tẽ′rĕk-sĕnt-mē′klōsh. A commune of the County of Jász-Nagy-Kun-Szolnok, Hungary, 66 miles southeast of Budapest (Map: Hungary, G 3). The extensive plain in which it is situated is noted for its production of cereals and live stock, and in the commune itself there is some manufacture of brick and of agricultural implements. Pop., 1900, 21,881; 1910, 23,074.

TORONE, COUNT OF. See BASILE, G. B.

TORON′TO. The capital of the Province of Ontario, Canada, on the north shore of Lake Ontario, opposite the mouth of the Niagara River and 333 miles southwest of Montreal (Map: Ontario, F 6). It is situated on the north side of a spacious inlet called Bay of Toronto, has a water frontage of about 10 miles from east to west, and extends inland from south to north about 6 miles, extreme width. The harbor or bay, about 5 miles long and 1 mile in width, is protected by a sandy islet, which extends into the lake in a south and west direction to a distance of 5 miles. The port accommodates the largest vessels that pass through the Welland Canal, and the passenger traffic employs a fleet of fast steamers. Canada's three transcontinental railways pass through the city, and one of them, the Canadian Northern, has its head offices located here.

The site of the city rises gently north from the lake shore for about 3 miles, where it ascends abruptly. The limits of the city have been extended on the hill, which has become a beautiful residential section. Toronto is brick-built. In general characteristics it is American, but the spirit and ideals of the people are thoroughly British. The city possesses many beautiful edifices, comprising chiefly office and educational buildings, churches, and public buildings. It has numerous attractive private homes. A group of four office buildings, ranging from 12 to 20 stories in height, form the hub of the business section, on the corners of King and Young streets. The most conspicuous group of buildings, for their beauty, is located in Queen's Park, about a mile from the water front, and comprises the Provincial Legislative Building and the University of Toronto. The former occupies a commanding position at the head of the broad University Avenue. To the west and north are situated the various edifices of the university, arranged in a wide circle. This is the premier seat of learning of the Dominion. Chief among these edifices is the main Arts building, a Norman structure. In the circle stands the new Knox College (Presbyterian), collegiate Gothic in architecture, while Victoria College (Methodist) and Wycliffe College (Anglican) are located in the vicinity. Other fine educational buildings are McMaster University (Baptist), Trinity College (Anglican), Upper Canada College, and St. Andrews College. The new $2,000,000 Technical School, a massive imposing structure, is one of the best-equipped schools of its kind in the world. Other notable buildings are the City Hall, with its stupendous 300-foot clock tower; Casa Loma, the residence of Sir Henry Pellatt, situated on the brow of the hill north of the city, a castle of old-English type; and the Government House, the home of the Lieutenant Governor of the Province, situated in Rosedale.

Toronto is distinguished for its churches, of which it has 263. The principal are St. James Cathedral (Anglican), a fine building in early English, erected in 1852; St. Michael's Cathedral (Roman Catholic); St. James and St. Andrews (Presbyterian); the Metropolitan Methodist Church, noted for its huge organ; Jarvis Street Baptist; Bond Street Congregational; St. Paul's and church of the Ascension (Anglican). Toronto maintains an excellent free-library system, including a reference library, a handsome structure situated on College Street, and 19 branches, with 231,000 volumes. It has three colleges of music, the Hambourg Conservatory, the Toronto Conservatory, and the Toronto College of Music, and possesses creditable art galleries, the John Ross Robertson historical collection at the College Street branch of the Public Library, and the Art Museum of Toronto collection at the Grange. The new Royal Ontario Museum on Bloor Street contains an important collection of historical and geological relics. The city is the hospital centre of Ontario, and in addition to the new $2,000,000 General Hospital there are the Western, Sick Children's, Wellesley, St. Michael's, Orthopædic, and Victoria, all imposing and well-equipped buildings. Six daily newspapers are published, the oldest of which, the *Globe* (Liberal), was founded in 1846. The others are the *Daily Star* (Liberal), the *Daily News*, the *Mail and Empire*, the *World*, and *Telegram*, the four latter being Conservative.

The city possesses 55 parks, several of them large and beautiful, having a total area of 1879 acres. Chief of these are High Park (335 acres), Exhibition Park (235 acres), and Humber Boulevard (129 acres), all within the city limits and equipped with splendid driveways. Exhibition Park is the home of the Annual Canadian National Exhibition, continuing two weeks each year, and one of the greatest of its kind in the world. The yearly attendance aggregates 1,000,000 people. It is famous for its agricultural, industrial, and art exhibits. Ontario's noted breeds of live stock are shown there. Riverdale Park possesses a zoölogical garden, with a valuable collection of animals. There are two amusement parks—Hanlan's Point, on the Island, and Scarborough Beach, at the eastern extremity of the city. The Island provides Toronto with another extensive, well-wooded park. It is the lungs of the city and lends itself to aquatic sports, for which Toronto is noted. Toronto has commodious armories, which are the headquarters of Canada's three volunteer regiments.

The city possesses water, gas, electric-light plants, and street-railway systems. It draws its light and much of its heat and power from Niagara Falls, at an exceptionally low rate of cost, through the medium of a private company and the Ontario Hydro-Electric Commission, a public institution. The phenomenal growth of the city has necessitated the erection of a new Union Station. Being the second financial and commercial centre of the Dominion, Toronto has an active shipping trade. Freighters come east with grain and return to the head of the lakes with Toronto manufactures for delivery in northwest Canada. In 1914, 2961 vessels with a tonnage of 3,040,000 tons arrived at the port. In 1916 the city was engaged in an elaborate programme for public improvements, involving an expenditure estimated at $350,000,000. Its per capita debt is the lowest of all large cities in Canada. A thousand acres of marsh on Toronto Bay has been reclaimed and is available for manufacturing plants.

Toronto is the chief distributing centre of the most productive province in the Dominion, especially in grain, fruits, and live stock, the latter involving a turnover of $50,000,000 a year. Manufacturing is important and widely diversified, the farm-implement industry and publishing business being the most notable. In normal times all industries employ 75,000 men. It is famous for its departmental stores, which do a Dominion-wide trade. It is a large wholesale centre, including dry goods, leather, footwear, and fruit. Its five packing establishments make it the Chicago of Canada. A new civic abattoir is a successful municipal enterprise. Manufacturing establishments number 1620, employing capital amounting to $215,000,000 and producing yearly manufactures worth $230,000,000, which represent one-eighth of Canada's total industrial output. Its iron and steel foundries are important, and its chief products are machinery, lumber, wall paper, stationery, clothing, ships, cabinet ware, iron rails, stoves, pianos, bicycles, carpets, brewery and distillery products, and drugs. It is an important insurance and banking centre. Clearings for 1915 aggregated $1,886,000,000. The city has an active mining-stock exchange as well as a large industrial-stock exchange.

The name Toronto is of Indian origin, meaning "a place of meeting," and was probably given by the Indians in 1749, when the French, who possessed the country at that time, built a fort and traded with them. British traders soon appeared from the New England colonies, and in the war between France and Britain, in 1759, which gave the country to Britain, the fort was destroyed in order to prevent English occupation. Governor Simcoe founded the present city in 1794, naming it York and making it the capital of Upper Canada. It was occupied and burned in 1813 by the United States forces. It was created a city in 1834, when its population had grown to 9000, and then became known once more as Toronto. It suffered severely during the rebellion of 1837 and also from fire in 1849 and 1904, the loss in property in the latter disaster being $8,000,000. Pop., 1871, 59,000; 1881, 96,196; 1891, 181,215; 1901, 208,040; 1911, 376,538. Consult C. B. Robinson, *History of Toronto and County of York* (2 vols., Toronto, 1885), and S. M. Wickett, "Municipal Government of Toronto," in *University of Toronto Studies: History and Economics*, vol. ii (ib., 1902).

TORONTO. A village in Jefferson Co., Ohio, 9 miles north of Steubenville, on the Ohio River, and on the Pennsylvania Railroad (Map: Ohio, J 5). Sewer pipe, brick, pottery, and glass are manufactured. The place was first settled in 1790 and was incorporated in 1878. Pop., 1900, 3526; 1910, 4271.

TORONTO, UNIVERSITY OF. An institution of higher education at Toronto, Canada, established in 1827 as King's College. The opening of the college was delayed for 14 years, and not till 1842 were the faculties of arts, medicine, law, and divinity established. In 1849 the institution assumed its present title, and in 1853 the faculties of medicine and law were abolished and the functions of the institution were divided between the two newly organized corporations of the University of Toronto and University College. By the Federation Act of 1887 the faculty of University College consists of professors in classical languages and literature, ancient history, Oriental languages, English, French, German, and moral philosophy. All other portions of the arts course were assigned to the faculty of the University of Toronto, the lectures of which are open to the students of University College and of all federating institutions. A faculty of medicine was established in 1887; in 1888 the Ontario Agricultural College was affiliated, and subsequently the Royal College of Dental Surgeons, the College of Pharmacy, the Toronto College of Music, the School of Practical Science, and the Ontario Veterinary College became parts of the university. Federated with the university are Victoria University, St. Michael's College, Trinity College, Knox College, and Wycliffe College. The attendance in 1914–15 was 4428, and the whole number of instructors in the university and University College was 401. The library contained about 135,000 volumes and 50,000 pamphlets. The total assets of the institution on June 30, 1915, were valued at $6,696,219, of which $5,521,899 represented the lands, buildings, and equipment. The income for the year 1914–15 was $916,895.

TORP, tŏrp, ALF (1853–). A Norwegian philologist, born in Stryn. He studied at Christiania University under Sophus Bugge (q.v.) and at Leipzig under Georg Curtius (q.v.). In 1894 he became professor of comparative philology and Sanskrit at Christianiá. Among his works are: *Beiträge zur Lehre von den geschlechtlosen Pronomen in den indogermanischen Sprachen* (1888); *Den græske Nominalflexion* (1890); with H. S. Falk: *Dansk-Norskens Lydhistorie* (1898); *Dansk-Norskens Syntax i historisk Fremstilling* (1900); *Etymologisk Ordbog over det Norske og det Danske Sprog* (2 vols., 1901–06; Ger. trans., 2 vols., 1910–11); *Gamalnorsk Ordbok med Nynorsk Tydning* (1909), with K. M. Hægstad. He also wrote on the ancient languages of Asia Minor and Etruria and on Greek inscriptions.

TORPE'DO (Lat. *torpedo*, numbness, crampfish, torpedo, from *torpere*, to be numb, stupid). A naval torpedo is an explosive device designed to destroy or injure a ship by blowing a hole in her hull at or below the water line. It consists essentially of the explosive charge, the fuse (which ignites the charge), and the case containing these.

Torpedoes have hitherto been divided into two classes, fixed and moving. The uncontrolled drifting torpedo was a forbidden weapon on account of the danger to noncombatant and neutral shipping. But its manifest naval advantages under certain circumstances caused improvement in its design, and a convention of the Second Hague Conference of 1907 permits the laying of drifting torpedoes under the designation of "unanchored contact mines," provided they automatically become inoperative one hour after the person who lays them ceases to control them. Unanchored contact mines were much employed during the Great War. In some cases, notably in the Dardanelles, the one-hour provision was not followed, though the mines may have been adjusted to become harmless after a longer interval had expired.

The classification of the drifting torpedo as a mine calls for a slight change in nomenclature. Instead of *fixed* and *moving*, we should be more accurate if we adopted the terms *nonpropelled* and *propelled*. Nonpropelled torpedoes are fully described under the head of MINE, SUBMARINE, the designation "torpedo" now being confined to some form of the propelled type.

Propelled torpedoes are (1) controlled or (2) uncontrolled. The controlled type are (*a*) spar, (*b*) towing, and (*c*) dirigible—the last-named class being either (1) locomotive or (2) self-propelled. The uncontrolled type includes (1) automobile, (2) projectile, (3) rocket.

Controlled torpedoes have long since passed out of favor, though attempts to develop a self-propelled torpedo steered by wireless apparatus have been made and some degree of success was obtained. The other types are all obsolete, and, so far as known, no attempt was made to use them in the Great War.

The spar torpedo was secured at the end of a spar rigged out from the bow or side of a boat or ship. Torpedoes of this kind were used with considerable success in the Civil War against vessels at anchor or operating in narrow waters. The searchlight and the rapid-fire gun rendered them obsolete. The Harvey towing torpedo and its modifications were towed by a boat or ship, its shape and steering vanes keeping it well out on the quarter of the ship using it. Its defects were apparent from the start, and it was never much used. The locomotive torpedo carried its own machinery, but received power from an external source. Nearly all were electrically driven through wires leading to the source of power and unreeling as the torpedo advanced; but the Brennan was propelled by two ordinary steel wires reeled up on drums within the shell. By hauling on these wires the screws were made to rotate and develop considerable speed. The self-propelled controllable torpedoes carried their own source of power—usually compressed air or carbonic-acid gas—and were all electrically steered through a small cable.

The projectile type of uncontrolled torpedoes was fired from a submarine gun. It received its most successful development in the hands of Ericsson, but he was unable to give it a reliable range of more than 150 yards, and this prevented its use. Rocket torpedoes are propelled by the reaction of gas escaping from the rear end of the torpedo. The surface type could be used only on very smooth water; the submerged type lacked speed; both carried very small explosive charges, were erratic, unreliable, and never had much vogue.

The class of propelled torpedoes most in use is the automobile or fish type. There are many varieties in service, each nation having developed its own or purchased its supply from the Whitehead Company. The Howell torpedo needs a passing notice. Its propelling power consisted of a heavy bronze flywheel driven at high speed up to the instant of discharge. The energy thus stored was utilized to drive the propellers and the gyroscopic force employed to keep the torpedo on its course. A fairly high speed was attained, but more important than this was its inherent strong directive force which made it much more accurate than the Whitehead. It continued to be used until a small gyroscope was added to the Whitehead type for steering purposes, and then the greater speed of the latter caused the Howell to be dropped.

The Whitehead was the first successful automobile torpedo and the most widely used. The details of the latest type are secret, but they differ but slightly from those shown in the accompanying plans. The torpedo shell is in three sections, consisting of the war head, the air flask, and the afterbody. In Fig. 1 *A* is the war nose, which is screwed into the head over the primer seat and carries a firing pin and releasing screw; *B* is the war head (an exercise head without explosive charge or war nose is used in ordinary torpedo target practice); *C* is the air flask, a forged steel cylinder which is much thicker than the other parts of the shell; *P* is the guide stud for holding the torpedo in position in the tube; *Q* is a strengthening band to support the guide stud; *V* is the balance chamber; *F* is the engine compartment; *G* is the afterbody; *H* is the tail frame which carries the rudders; 1 is the firing pin; 2 is one blade of the releasing screw; *B*, the war head, containing the explosive charge 3 of wet guncotton, and 4 the priming charge of dry guncotton in a hermetically sealed case which is inserted in the front end of the war head before screwing in the war nose. The releasing screw is then in the locked position. As the torpedo moves ahead the blades of the releasing screw cause it to revolve and unscrew until the firing pin is unlocked. If the torpedo then strikes any object, such as a ship, the firing pin is driven in and explodes the charge. In Fig. 2, 6 and 8 are the charging and stop valves for charging the air flask with compressed air at about 2500 pounds per square inch; *T* is the depth regulator which connects by the bell-crank lever *M* to the regulator spring, which presses against the hydraulic piston (16); the hydraulic piston receives the water pressure on its after side, as the engine room (*F*) is opened to the sea, and operates small levers pressing against a lever that is pivoted on a pendulum (17), and the motion is transmitted through the rod *N* to a crank and thence to the steering engine (18), which moves horizontal rudders (not shown) by means of the rod 24; *D* is the operating valve group which controls the supply of air to the engine (*W*); 10 is the starting lever; *E* is the releasing mechanism; *K* is the gyroscope for steering in a horizontal plane, and 20 is the gyroscope wheel; 13 and 14 are the propellers; 15 is the bevel gear which permits the two propellers to be driven in opposite directions; and 22 are the rudders actuated by the gyroscope, which serves to keep the torpedo on the desired course. It is able to do this through the property of the gyroscope to retain its position in the plane of rotation. See GYROSCOPE.

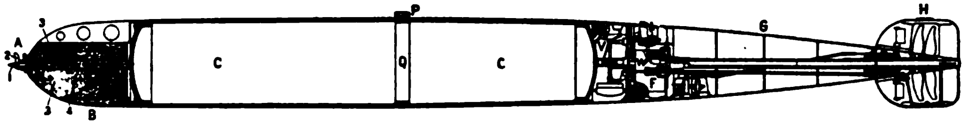


FIG. 1. WHITEHEAD TORPEDO.

The recent types of the Whitehead torpedo are larger than the one shown (which is the 18-inch). The most powerful are 21 inches in diameter, about 22 feet long, have larger war heads than the one shown and more engine power; also alcohol reservoirs and heaters which are located in the afterbody close to the air flask. These torpedoes have long range and small explosive charges or short range and large charges. The maximum effective range of torpedoes is now about 8000 yards, though torpedoes of 10,000 yards' range have been made. The average speed for long range is 25 knots or less. For short ranges (up to 2500 yards) speeds exceeding 50 knots have been attained. The short-range torpedo for submarine use has a large explosive charge, the Germans employing a type which carries 428 pounds or more of trinitrotoluol.

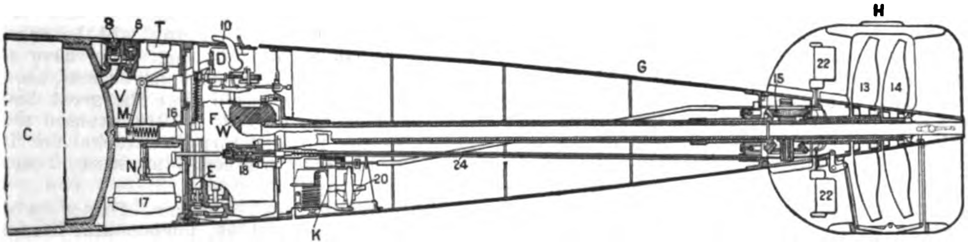


FIG. 2. PROPELLING AND STEERING MECHANISM OF WHITEHEAD TORPEDO.

The Bliss-Leavitt torpedo was devised by F. M. Leavitt of the Bliss Company of Brooklyn. While in many respects similar to the Whitehead, it contained two very important improvements. First, alcohol was used to heat the compressed air, and, second, the engine was of the turbine type. The use of compressed air had always given much trouble. As the air expanded in the engine it caused intense cold and congealed the lubricating oil to an extent that almost destroyed its usefulness. The alcohol heater obviated this difficulty and added 25 to 50 per cent to the available speed or range. It also facilitated the use of higher air pressures in the flask and in this way again improved the general efficiency. The turbine engine was not at first very satisfactory, but by carefully balancing the effort in both directions the tendency to rotate the torpedo was avoided and the new machinery was found to be much superior to the reciprocating Brotherhood engine of the Whitehead. Both the Whitehead and the Bliss-Leavitt torpedoes are used in the United States naval service.

History. It is not unlikely that attempts to employ torpedoes or mines were made in the early days of gunpowder, but the first occasion on record in which they were used was in 1585, when an Italian engineer by the name of Gianibelli (q.v.) partially destroyed a bridge across the Scheldt at Antwerp by means of small vessels each carrying a considerable quantity of gunpowder which was exploded by clockwork mechanism. Nothing more is heard of torpedoes until 1730, when the French scientist Desaguliers made some experiments with some of the rocket type which were fired under water and with which he is said to have destroyed several boats. The first torpedoes to be used in war against ships were designed by an American, Capt. David Bushnell, who also built the first submarine torpedo boat, though not the first submarine boat. After making numerous successful experiments Captain Bushnell made three attempts to destroy British men-of-war. In the first Sergeant Lee used Bushnell's submarine boat (see TORPEDO BOAT, SUBMARINE, for description and illustration) and actually got under H.M.S. *Eagle*, but failed to attach and explode his torpedo, owing to inexperience in handling his novel craft and the bluntness of the screw he tried to use. The second attack was made on H.M.S. *Cerberus* by drifting torpedoes; this failed, but one of the torpedoes was picked up by the crew of the prize schooner astern of the *Cerberus* and, exploding on board, killed three men, destroyed a boat, and injured the schooner. The third attempt, in the Delaware River, was the celebrated Battle of the Kegs, and it failed because the British ships had hauled in to the wharves to avoid the ice; but it created much confusion and alarm among their crews. The next man to take up torpedoes seriously was Robert Fulton, who began his experiments on the Seine in 1797. His first attempts were chiefly failures, but in 1801, at Brest, he destroyed a small vessel with a submarine mine containing 20 pounds of gunpowder. This is believed to be the first vessel sunk by a torpedo, but he afterward succeeded in several instances, and where the attack failed it was owing to the movement of the vessel from above the torpedo and not to defects in the torpedo. In one instance a British brig was destroyed by two torpedoes made by him containing 180-pound charges of gunpowder fired by clockwork. In 1812 and 1813 another American, Mr. Mix, made unsuccessful attempts to blow up British ships. In 1820 Captain Johnson, an Englishman, with a submarine boat attached a torpedo to the bottom of a vessel and exploded it. In 1829 Col. Samuel Colt began his torpedo investigations, developed the electric firing of mines in 1842, using in one instance wires 40 miles long with complete success.

In the Civil War in America the torpedo came quickly to the front as a serious weapon. The few ships of the Confederates offered little opportunity for the use of torpedoes by the Federals, but the great fleet of the latter and the necessity which often compelled the vessels to operate in narrow waters gave a multitude of chances which their enterprising antagonists were quick to seize. The unsuccessful attempts were hundreds in number, but during the course of the struggle 7 Federal armor-clads, 9 gunboats, 6 transports, and 1 cruiser were sunk or destroyed, and 2 armor-clads, 3 gunboats, 1 transport, and 1 large cruiser were seriously injured. Of the latter, 1 cruiser and 1 armor-clad were attacked by boats using spar torpedoes. The only important Federal success was the destruction of the armor-clad *Albemarle* by Lieutenant Cushing, who also used a spar topedo.

While all this was going on Captain Lupuis of the Austrian navy and Mr. Whitehead began the development of the self-propelled torpedo. The idea of a small, self-propelled boat carrying an explosive charge and directed from a distance had occurred to Captain Lupuis in 1860, but it was not until 1864 upon his association with Mr. Whitehead that any craft of the sort were built. Mr. Whitehead, who was an English engineer acting as superintendent of engineering works at Fiume, took hold of the project with great interest. He soon gave up the plan of using directing wires and bent his energies to the development of a completely automatic device. In 1868 the first official trial was held before a board of Austrian officers, and its report resulted in the adoption of the weapon in the Austrian service, although the speed attained was only about seven knots. From this time to the present the improvement has been continuous, the speed rising to 50 knots and the directive force becoming almost absolutely certain when the conditions are favorable. All naval powers now use the Whitehead or some modification of it, and many (including the United States) have purchased the right to manufacture them.

Shortly after Whitehead's successful experiments Captain Harvey, R.N., brought out his towing torpedo, which had a vogue wholly unwarranted by its performance, but it was pleasing from its simplicity. About 1870 Commander (later Rear Admiral) Howell, U.S.N., conceived the idea of applying the principle of the gyroscope to automobile torpedoes for the purpose not only of steering them but to afford motive power as well. His torpedo was gradually improved until in 1898 it attained a speed of about 28 knots with almost perfect directive force. As already stated, the application of the Obry gyroscopic gear to the otherwise perfected Whitehead, drove the Howell out of the field.

In 1873, while the success of the Whitehead remained uncertain in many minds, J. L. Lay brought out his first controllable torpedo, propelled by carbonic-acid gas and directed by electricity through wires paid out from a reel in the torpedo as it advanced. The Lay was followed by a host of similar inventions, the Lay-Haight, Patrick, Nordenfelt, Brennan, Sims-Edison, and others; but all are now discarded. Controlled torpedoes of the dirigible, self-propelled type and steered by wireless induction currents have been under experiment for many years. All the earlier designs apparently failed, but an American design, brought out in 1915, by J. H. Hammond, Jr., is very promising.

The first automobile torpedo fired with hostile intent was directed at the Peruvian monitor *Huascar* by the British cruiser *Shah*, but the shot failed through being fired at too long a range. In subsequent wars it has been used with increasing frequency and with moderate success. But it was not until the advent of the submarine that the full measure of its importance was reached. The ability of the submarine to approach its target closely without being discovered brought out a new type of torpedo in which the explosive charge was greatly increased at the expense of range. In the Great War almost every vessel struck by one of these torpedoes was destroyed; and, owing to the short ranges at which the shots were made, few of them missed.

The enormous gun power of modern battleships and battle cruisers, whereby the fighting range has greatly increased, seems to preclude the use of torpedoes by such vessels except under unusual circumstances and it is possible that very few if any will be carried in future vessels of this sort. Nor have surface torpedo boats achieved much success, though it must not be forgotten that the great battle fleets had not up to May 1, 1916, exposed themselves to any form of torpedo attack. See TORPEDO BOAT; TORPEDO BOAT, SUBMARINE; TORPEDO DIRECTOR; ETC.

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TORPEDO, or ELECTRIC RAY. A ray (q.v.) of the family Narcobatidæ, which inhabits warm seas and often is of large size. These rays have a broad flat body with a comparatively slender tail and are of interest because of the electrical powers which they possess. (See Electric Fish.) There are about 15 species, of which the best known is *Torpedo marmoratus* of southern Europe. A similar species, the crampfish, or numbfish (*Torpedo occidentalis*), occurs on the Atlantic coast of the United States and is said to attain a weight of 200 pounds. The same or a very similar species is found on the coast of California. See Plate of Electric Fish.

TORPEDO BOAT. A small war vessel fitted to use the torpedo as its primary weapon of attack. The principal requirements of torpedo boats are high speed, efficient means of launching their torpedoes, and, in proportion to size, relative handiness and seaworthiness. They are of two principal types—surface boats and submarines. (See Torpedo Boat, Submarine.) Surface boats are of three classes: (*a*) torpedo-boat destroyers; (*b*) seagoing boats; (*c*) harbor boats. Small torpedo boats of 5 to 15 tons were formerly carried by large ships, but these are now obsolete and few harbor boats have been built in recent years.

The destroyer, originally planned to destroy torpedo boats, has nearly supplanted them and in its development has extended over such a wide range of size and characteristics as to demand further subdivision. For instance, the *Swift*, of the British navy, is officially classed as a destroyer, though she has a displacement of 2170 tons. Moreover, there are comparatively few torpedo boats except submarines to destroy. As a defense against these, the destroyer type of vessel is quite efficient. When they are placed as a screen about a ship or fleet, whether steaming or at anchor, submarines have found it nearly impossible to get home an attack.

In order to be efficient as protectors to battleships and cruisers great seaworthiness is demanded, and this requires large dimensions. The average size of the modern destroyer which is designed to accompany the fleet is 900 to 1200 tons. Larger boats have been built, but the necessity for them is not yet fully proved. The armament of a first-class destroyer is four 4-inch guns and four to eight torpedo tubes. The speed is from 29 to 35 knots. In size destroyers range from 300 to 2170 tons, but the larger ones should be styled torpedo vessels and those below 400 tons called torpedo boats.

The modern torpedo boat is usually designed to form a part of the *défense mobile* of a coast. The displacement varies from 200 to 400 tons; the armament consists of one or more 3-inch guns and smaller pieces or of smaller pieces only; the speed is from 25 to 30 knots; usually 2 or 3 torpedo tubes are carried.

Surface torpedo boats can hope to be successful only when attacking under cover of night or of thick fog, and several should attack a ship simultaneously—from different directions if possible. If the vessel is under way and steaming at good speed, an attack from abaft the beam gives little promise of success, as the approach must necessarily be slow and the chances of discovery increase, while the torpedo may be deflected by the ship's wake and can only overtake the ship at a rate equal to the difference in speeds of ship and torpedo. The boat must, therefore, be nearer her target when she fires than if attacking an approaching ship. In the Great War torpedo boats were used chiefly as scouts against submarines.

In its earliest form the torpedo boat contained merely a large quantity of powder and was itself destroyed by the explosion. Craft of this type were used by Gianabelli at Antwerp in 1585. (See Torpedo.) The first evolutionary step developed boats which carried torpedoes that were designed to be attached to the bottom of the enemy's ship. All of this type were submarine. (See Torpedo Boat, Submarine.) The first surface boats appeared during the American Civil War, and the first partial success was achieved (October, 1863) in an attack by a Confederate boat on the Federal armor-clad *New Ironsides*, in which the latter was slightly injured. Practically all of the torpedo boats of the war used spar torpedoes, which were carried at the end of a long spar or boom rigged out beyond the bow, and nearly all were ordinary steam launches or pulling boats, though the boat which attacked the *New Ironsides* and one or two others were specially built craft with nearly submerged hulls. In 1873 the first fast (speed, 15 knots) specially designed torpedo boat was built by Thornycroft, of Chiswick, England, for the Norwegian government and was fitted for using the Harvey towing torpedo, then in much favor. In the next year both Thornycroft and Yarrow (of Poplar, near London) constructed boats for various foreign governments, and they built several in the ensuing year, but none for Great Britain. About the same time Herreshoff completed a very fast boat for the United States navy. In 1877 Herreshoff brought out the first boat fitted to use Whitehead torpedoes, and although many subsequent boats were designed to carry spar torpedoes, the Whitehead rapidly made its way, so that by 1880 it had practically displaced all rivals except the Howell and Schwartzkopf, which were of somewhat similar type. Consult J. T. Scharf, *History of the Confederate Navy* (New York, 1887), and Johnson, *Defense of Charleston Harbor* (Charleston, 1890). See Torpedo; Torpedo Boat, Submarine; Torpedo Net, and references there given.

TORPEDO-BOAT DESTROYER. See Torpedo Boat.

TORPEDO BOAT, SUBMARINE. Except for purposes of naval war the submarine boat had, up to 1916, a very narrow field of usefulness. Lake's first boat was designed for exploration of the ocean bottom by furnishing a base from which divers could readily operate undisturbed by rough water, but it was not often employed. As torpedo boats, submarines are built of three types: (*a*) coast-defense, (*b*) cruising, and (*c*) fleet.

Coast-defense boats are small, have a very moderate radius of action, and possess inferior habitability. They are designed to operate from a base which is near at hand, so that the cruising radius and habitability can be sacrificed without loss of efficiency. The early submarines were all of this type, being small, slow, and defective in many ways. More recent boats, embodying later improvements, were specially designed to operate from a base near at hand, and sacrificed size, habitability, and cruising radius without loss of efficiency in other directions. They vary in displacement (submerged) from 250 to 600 tons, the surface tonnage being 20 to 40 per cent less. The length is 150 to 200 feet; beam, 15 to 20 feet; speed, 10 to 16 knots on the surface and 8 to 11 knots when submerged. Greater speed is desirable, but is difficult to obtain in boats of small size. The cruising radius is 1000 to 2000 miles; the number of torpedo tubes, 4 to 8; one gun of 3-inch or 2.25-inch calibre is usually carried, supplemented by an antiaëroplane gun and perhaps a machine gun of musket calibre. The latter is almost invariably kept below until the boat has reached the surface, when it is passed up the hatch and placed on its mount. There are no quarters for officers or crew (20 to 30 in number), all possible space and weight being devoted to machinery and torpedoes. Small transoms or seats are provided for the officers and men not actually on watch or engaged in work. The propelling machinery consists of electric motors for submerged navigation and Diesel or gasoline engines for surface cruising. The current for the motors is supplied by storage batteries which are charged at the base, but the charge may be renewed by connecting up the charging apparatus to the oil engines when on the surface.

Cruising submarines are designed for long-distance, independent work. They must possess good habitability, large cruising radius, space for a number of torpedoes, and as much surface speed as it is possible to give them after satisfying these requirements. They have a submerged displacement of 800 to 1200 tons and a surface displacement of 650 to 1000 tons. The length is from 225 to 275 feet; beam, 18 to 25 feet; maximum surface speed, 16 to 20 knots; maximum submerged speed, 10 to 14 knots; cruising radius, 4000 to 8000 miles (using part of the submerging tanks for oil fuel when leaving the base); submerged radius of operation on a single charge of the batteries, 50 to 100 miles; number of torpedo tubes, 4 to 8; battery, one or more 3-inch guns, one or more antiaëroplane guns, one or more machine guns (kept below when the boat is submerged); officers and crew, 40 to 50. The machinery is similar to that of coastal submarines, though many of the larger boats are fitted with steam engines for surface cruising, as the Diesel engines have given much trouble. The principal difficulty with steam machinery is the heat radiated. This has been largely overcome by nonconducting and water-cooled jackets and the cooling effect of the expanding compressed air which has been water-cooled during compression or afterward. The engines of new boats are either Diesel, geared steam turbines, or fitted for electric drive (see SHIPBUILDING, *Marine Machinery*); the latter, when perfected, may be adopted, as it offers many advantages in connection with storage batteries and electric propulsion when the boat is submerged.

Fleet submarines were a new type which in 1916 had not yet been tested by actual service. They were expected to be able to accompany the battle fleet. They must, therefore, possess seaworthy qualities of a fairly high order, have good habitability, excellent surface speed, and a large radius of action, though fuel supplies could be obtained from the surface vessels, preferably from auxiliaries or "mother" ships. They must be efficiently armed to destroy the submarines and torpedo vessels of the enemy and to stand some punishment from guns of small craft. Owing to the novelty of their rôle, the details are not well settled and cannot be until experience has furnished its lessons. So far as known, the designs of boats building in 1916 called for displacements of 1500 to 2000 tons when submerged and 1200 to 1600 tons on the surface; the maximum surface speeds, 20 to 26 knots, submerged speeds, 12 to 15 knots; cruising radius, 3000 to 6000 miles; submerged radius on a single charge of batteries, 75 to 150 miles; number of torpedo tubes, 4 to 10; battery, two to four 4-inch guns; one or more antiaëroplane guns, several machine guns; officers and crew, 50 to 100. The propelling machinery is similar to that of cruising submarines, but of greater relative power in order to secure higher speed.

Still larger submarines, called submersible battleships, have been proposed. The designs provide for one or more armored turrets carrying heavy guns. In some of the proposals the whole vessel may be submerged; in other plans the turrets are always above water. No vessels of this sort were building so far as known in 1916.

The earlier submarines had very little reserve buoyancy and could run on the surface, with open conning towers or ventilating pipes, only when the sea was smooth. Their habitability was therefore poor, and their radius of action was more circumscribed by this fact than from all other causes. About 1900 the French brought out a type which they styled submersibles. They differed radically from previous boats, having two hulls, one inside the other. The outer hull resembled that of an ordinary torpedo boat, but with few projections from or irregularities in the general outline in order to present a smooth surface when submerged. Inside this there was a second hull of nearly circular cross section and as large as the shape of the outer boat permitted. To effect submergence water was admitted into the space between the hulls. This brought the boat to the awash condition; further submergence was effected by permitting the ballast tanks to fill. As compared with the submersible, the relative advantages of the former submarine type were: greater submerged speed and strength and more tubes in the bow (made possible by the blunt form); the disadvantages were less habitability, due to reduced buoyancy and sea-keeping qualities, and lower surface speed, due to poor form of hull. The relative advantages of the submersible were greater surface speed, superior habitability, and better sea-keeping qualities; the disadvantages were less strength of hull, reduced speed when submerged, and fewer torpedo tubes in the bow on account of fineness of form.

In the course of time the two types have approached each other in design. The submarine has been given a finer model and a superstructure whose top forms the deck. The present submersibles have only partial double hulls. It is therefore difficult to classify many recent boats. In the first submersibles the light cruising displacement was only half of that in the submerged condition. In recent French types the surplus buoyancy is about 35 per cent, in British boats about 20. Good habitability is obtained in the latter by raising the superstructure, but its width is reduced to keep the submerged displacement as moderate as practicable in order to prevent unnecessary reduction of the submerged speed. The high, roomy conning tower introduced by Lake is very generally adopted and affords support for a deck steering station high above the water, where it can be protected against spray by a removable canvas screen similar to that of ordinary surface vessels.

Like other types of war craft, the submarine has steadily increased in size, for it was only by augmenting the dimensions that its present powers could be attained. The first American boats displaced 120 tons when submerged; the fleet submarines designed in 1915 were to have a tonnage of more than 1500. The same sort of development has taken place in other navies. The British and German boats which made long cruises in the Great War (see War in Europe) were of 800 to 900 tons. By using part of their submerging tanks for fuel, these boats have a cruising radius of 3000 to 5000 miles. As submarines have increased in size and speed, they have become more and more expensive to build. The cost of large fleet submarines, fully equipped, is about $1000 per ton, or more than twice that of surface battleships or cruisers.

One of the most notable changes in the equipment of recent submarines is the battery. About 1912 a short 3-inch gun was mounted on a few of the larger boats. The next step was to fit antiaëroplane guns, for the aëroplane is a deadly enemy. Later machine guns were supplied, and the larger boats were to be fitted with 4-inch guns in place of 3-inch. As a defense against the guns of similar craft and of surface boats, it is proposed to fit a protection deck in submarines. This will be just below the surface when the submarine is in ordinary cruising condition, and the space above it is to be closely subdivided. Another important addition to submarine equipment is the gyroscope compass. (See Compass.) Magnetic compasses are very unreliable when wholly surrounded by the hull of a vessel, and accurate steering by means of them was found to be impossible when the boat was submerged. The gyro compass has changed all this and made submerged navigation much more accurate and safe. The gyro principle may also be used to keep the boat on an even keel, laterally and transversely—now a difficult matter and requiring constant care and watchfulness.

Submarines are kept on an even keel by ballast tanks and horizontal rudders. The water is moved by compressed air acting on the surface of the water in the tanks and by pumps. The horizontal rudders are operated by hand or by motors. If gyro stabilizers are used they will automatically operate the machinery and control this work.

Submerging is effected by admitting water to the submerging tanks, and the boat is brought to the surface by expelling this water with compressed air and pumps. The time required to submerge and emerge depends on the size of the boat, the reserve displacement, and the capacity of the ejecting and pumping equipment. When in the presence of the enemy boats do not run in cruising trim, but in a condition called awash, with only the conning tower and a small portion of the hull above water. When so close that they may be observed (or attacked), they are submerged until only the periscope (q.v.) is visible. From the awash condition this takes but a few seconds. Under favorable circumstances it takes two or three minutes for a boat to emerge sufficiently to use her guns, and this is a dangerous time for her if discovered by a surface vessel or another submarine. Consequently every effort is made to shorten the interval as much as possible by carrying large tanks of compressed air and very efficient pumps and by forcing her to the surface with the horizontal rudders. In the earlier boats submerging and emerging were almost entirely effected by the horizontal rudders, the hull being inclined at a considerable angle during the operation; this of course facilitated the filling or emptying of the tanks. Some recent boats submerge and emerge on a level keel without using the rudders; others use them, as already noted, to expedite the operations.

The chief difficulties in the way of submarine navigation are: (*a*) securing safety; (*b*) obtaining high speed on the surface and fair speed below; (*c*) steering a straight course and avoiding obstacles; (*d*) securing adequate habitability; (*e*) insuring stability. For submarine torpedo boats there are other difficulties, such as directing and discharging the torpedo and the slow submerging and emerging which add to the dangers of operation.

Perfect safety can never be obtained, and the frequent accidents to submarines show we are yet far from such a goal. The greatest source of trouble seems to be the storage batteries. No solution is in sight except to improve the batteries and inclose them in such a manner that the gases from them cannot escape into the hull nor collect in such a way as to permit a dangerous explosion.

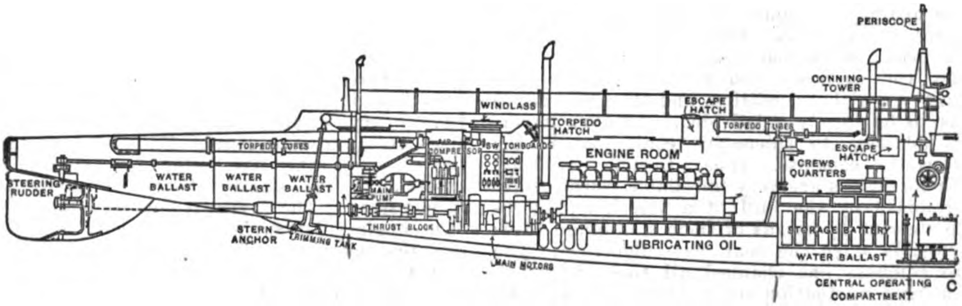
High speed in surface torpedo boats is obtained through lightness of hull construction. This is not possible in submarines which must have heavy framing and thick plating to resist strong water pressure. Except by the sacrifice of every other attribute, high speed is impossible in the smaller boats; adequate size is necessary. The earlier submarines used gasoline engines for surface propulsion. For various reasons heavy oil engines replaced them. But these in turn have proved unsatisfactory, and, as already stated, steam machinery is being fitted in large boats.

The navigation of submerged vessels is exceedingly difficult. The periscope (q.v.) is nearly useless at night, and it is impossible to see clearly under water, even for a few feet, unless the vessel is absolutely at rest. The gyro compass and gyro stability gear are doing much to facilitate operations, but submarine navigation is still very uncertain and dangerous. The habitability of boats naturally increases with their size as well as through improved appliances. Large vessels can have separate compartments for sleeping and cooking and for the machinery, and ventilation is easier. The cooking and heating are done with electric stoves or waste heat from the boilers or engines. This waste heat is often a serious source of trouble, especially in small craft.

The conditions affecting the stability of an entirely submerged vessel differ considerably from those which control that of one floating on the surface. (See Shipbuilding.) Since the sectional area of the immersed body remains unchanged at all angles of heel and pitch, the position of the centre of buoyancy remains constant; the righting moment therefore grows very slowly as the boat heels or pitches. By suitable ballasting or arrangement of weights adequate transverse stability is not very difficult to obtain. But longitudinal stability is quite another matter. The shifting of weights (moving of men, torpedoes, and liquids in partly filled tanks) is a very serious matter, particularly in small boats. It is counteracted by horizontal rudders or quickly shifting water ballast. To do this effectively requires experience and constant attention. If the gyro stability gear can perform the duty automatically, it will add much to comfort and safety.

The difficulties experienced in discharging torpedoes are closely connected with the question of stability. In addition to the trouble of handling the torpedoes in a very contracted space and of giving them the correct direction at the moment of firing, it is necessary that the boat should be nearly horizontal when the torpedo leaves the tube, else it will take too deep a dive or rise to the surface at the beginning of its run. The shock of firing and the sudden release of weight at the bow as the torpedo leaves the tube cause much longitudinal disturbance in the boat and may bring it to the surface if not carefully counteracted, while the change in trim adds to the difficulty of maintaining a constant depth.

The torpedoes used in submarines are usually the same as those for surface boats, but the Germans (and other navies are following their lead) are supplying a short-range torpedo with a very large bursting charge—more than double that of the ordinary long-range type—the reduction of weight in the air flask being utilized to increase the explosive charge. As ordinary submarines must approach the enemy quite closely (except in very smooth water) in order to see clearly, it is thought by some that long-range torpedoes are not so necessary for them. See TORPEDO.



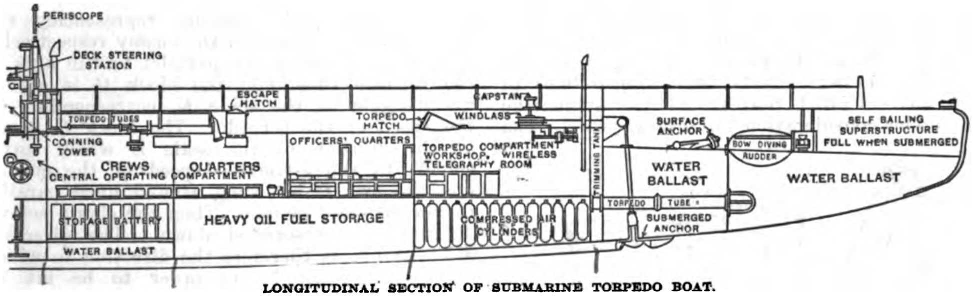
LONGITUDINAL SECTION OF SUBMARINE TORPEDO BOAT.

For several years the relative importance of the submarine as a weapon of war has been the subject of much speculation and discussion. A few weeks before the outbreak of the great war, on June 5, 1914, Rear Admiral Sir Percy Scott of the British navy wrote a letter to the London *Times* on the subject of the "Submarine Menace," in which he expressed himself substantially as follows: (1) Submarines have done away with the utility of surface ships. (2) As no man-of-war will dare to come within sight of a coast that is adequately protected by submarines, battleships in future will not be able to (*a*) attack ships that come to bombard our ports, (*b*) attack ships that come to blockade us, (*c*) attack ships convoying a landing party. (3) Nor will battleships be able to (*d*) bombard an enemy's ports, (*e*) blockade an enemy's ports, (*f*) blockade an enemy's fleet, (*g*) convoy a landing force. (4) As there will be no enemy's fleet to attack, when it is unsafe for any fleet to put to sea, this function of the battleship will cease to exist. (5) If we go to war we shall have to lock our dreadnoughts up in some safe harbor, if we can find one. (6) If by means of submarines we stop egress from the North Sea and the Mediterranean, it is difficult to see how our commerce can be much interfered with. (7) Not only is the open sea unsafe, but in narrow waters and harbors surface ships are at the mercy of submarines. (8) What we require is an enormous fleet of submarines, airships, and aëroplanes, and a few fast cruisers, provided we can find a place to keep them in safety during war time.

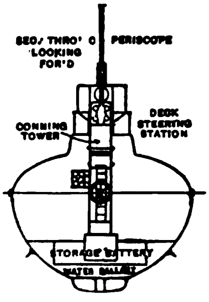
Admiral Scott's letter created a great sensation, both in the naval world and in the world at large, chiefly because he was the greatest living naval artillerist. The enormous improvement in naval target practice and the accuracy of gun fire in recent years had been due to him more than to any other man. Moreover, he was regarded as an ardent advocate of the dreadnought battleship and a firm believer in the superiority of the gun over all other naval weapons.

The War in Europe of 1914–16 witnessed the first test of the submarine on an extensive scale. Opinions of naval experts differ considerably as to how far this war demonstrated the effectiveness of the submarine for offensive purposes. During the early stages of the war the success of the German submarines in sinking a number of British and French warships led many persons to believe that the predictions of Admiral Scott were warranted. As the war progressed, however, the British authorities appear to have adopted some effective means of protecting their battleships, at least in the restricted area about the British Isles, from submarine attack. As commerce destroyers the submarines scored heavily, but their use in this connection involved serious questions of international law. The frail construction of the submarines made them vulnerable to attack even by armed merchantmen, if they were discovered before attacking. It was difficult, therefore, for the commanders of submarines to observe the accepted rules of international law, which required that noncombatants on merchant vessels should not be jeopardized, without exposing their vessels to destruction. Under these conditions German submarines sank a considerable number of belligerent and neutral merchantmen without warning, which involved Germany in serious difficulties with neutral nations, especially the United States. (See WAR IN EUROPE.) While the operation of submarines in accordance with the principles of warfare laid down for above-surface warships materially reduces their effectiveness for offensive purposes, nevertheless, they are weapons of vast naval usefulness and, if properly handled, can greatly change the character of naval war. Indeed they have done this much already. If fitted with long-range torpedoes and handled in groups against an active fleet of battleships properly protected by destroyers and aircraft, we shall be able to form a more definite opinion of their capabilities. Up to 1916 they seem to have operated independently except in the vicinity of their own coast, though the British boats in the Baltic may be an exception.

The great dread that submarines first inspired was largely due to lack of knowledge as to means of defense against them. In the great war a screen of destroyers surrounding ships or fleets proved very effective. In the narrow waters of the English Channel heavy wire nets kept this area nearly free from submarine activity and permitted the British to transport troops and munitions of war with comparative safety. In connection with the nets the British employed small, fast motor boats armed with light guns, and these destroyed many submarines of the enemy which were caught in the nets and rose to the surface. Destroyers and patrol boats of various kinds were also successfully used, while the aëroplane proved to be an excellent detector even when the boats were some distance below the surface. In addition to signaling the enemy's position and course they assisted in the attack, and at least two submarines were destroyed by aëroplane bombs. In the protection of fleets against submarine operations they may prove a most decisive factor.

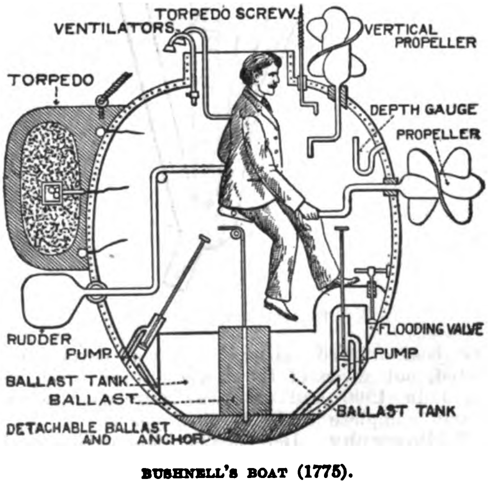


LONGITUDINAL SECTION OF SUBMARINE TORPEDO BOAT.



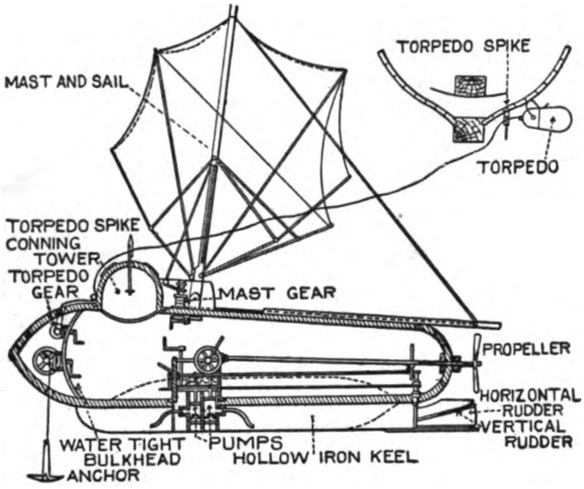
CROSS SECTION OF SUBMARINE TORPEDO BOAT.

History. When or by whom was built the first submarine boat will probably never be known. It is said that Alexander the Great was interested in submarine navigation, while subaqueous attack of vessels was studied at least as early as the thirteenth or fourteenth century. M. Delpeuch states that some English ships were destroyed in 1372 by fire carried under water. In the early part of the seventeenth century, submarine boats were numerous, and in 1624 Cornelius Drebbel exhibited to King James I on the Thames a submarine boat of his own design. By 1727 no less than 14 types of submarines had been patented in England alone. In 1774 Day began experiments with a submarine boat at Plymouth, England, losing his life in the second submergence trial. In the following year David Bushnell built his first boat, with which Sergeant Lee attacked H.M.S. *Eagle* in New York harbor. Lee actually got under the ship, and the attack failed only because the screw by which the torpedo was to be attached to the *Eagle's* bottom was not sharp enough. Robert Fulton's experiments in France and America (1795–1812) demonstrated that a vessel could be built which could descend to any given depth and reascend at will. Plunging mechanism was devised about the middle of the eighteenth century, but Fulton developed the vertical and horizontal rudders and provided for the artificial supply of air. A form of periscope existed in 1692 and an improved kind was patented in 1774; in 1854 Davy still further developed it. Phillips's wooden boat on Lake Erie was crushed by the water pressure, and the same fate befell Bauer's iron boat *Plongeur-Marin* (Fig. 1 on Plate) at Kiel in 1850. In 1863 McClintock and Howgate built a semisubmarine hand-propelled boat for the attack on the Federal fleet, but it sank four times, each time drowning the entire crew of eight men. In the same year several larger boats propelled by engines were commenced in Europe, and these at intervals were followed by others designed by Hovgaard, Goubet, Zédé, Nordenfeldt, Tuck, Holland, etc. The French navy began experimenting with submarine boats about 1885. The *Gymnote* was built in 1888 and the *Gustave Zédé* in 1893. The *Morse* was commenced in 1894, but remained uncompleted until 1899, pending additional experiments with the *Gymnote* and the *Zédé*. In that year the

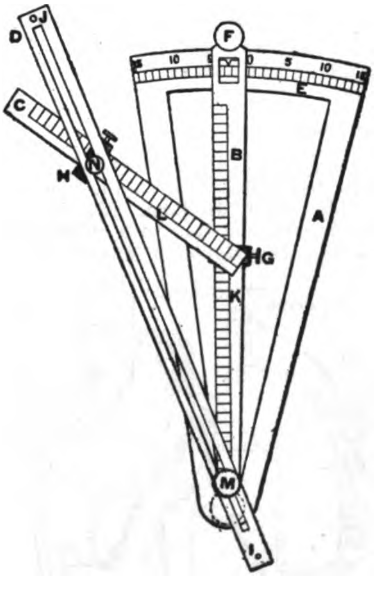


BUSHNELL'S BOAT (1775).

construction of submarines was actively commenced, 10 being launched in 1901. In 1886 Nordenfeldt built two large submarines for Turkey, but little was ever done with them after they passed into Turkish hands. In 1889 Spain built the *Peral,* Portugal following with the *Plongeur* in 1892. Italy built the *Delfino* in 1895. The United States had the submarine boat under consideration for several years. The first boat ordered (about 1895) was never completed, but seven of the Holland type were ordered in 1900 and one was purchased when nearly complete early in that year.



FULTON'S NAUTILUS (1801).



TORPEDO DIRECTOR.

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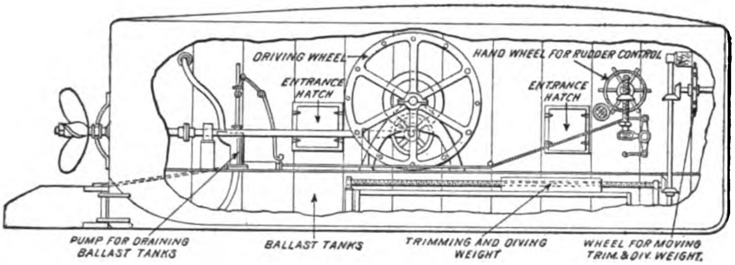
TORPEDO DIRECTOR. An instrument designed to indicate the proper moment at which to fire a torpedo from a ship or torpedo boat. It is placed on deck, or in a port or airport giving a clear view of the enemy. The type shown in the sketch is for a bow torpedo tube on a torpedo boat; a broadside director differs chiefly in having a greater arc of train for the arm *B.* The instrument consists of a metal sector, *A,* graduated along the limb *E* into degrees of arc. On this are three movable arms, *B, C,* and *D. B* and *D* are pivoted on *A* at the centre of the arc *E,* while *C* pivots on the sliding block *G. B* and *C* are graduated into similar and equal divisions, representing the speed of the torpedo and the enemy respectively. The arm *B* is first set parallel to the axis of the torpedo tube, and the block *G* is set at the division of the scale *K,* corresponding to the speed of the torpedo. The block *H* is set at the division of the scale *L* which corresponds to the estimated speed of the enemy, and the arm *C* is swung around until parallel to his supposed course. Then the clamp screws *M* and *N* are screwed down. The direction *MN* (or *IJ*) is therefore the direction in which the enemy must be in order to be hit by the torpedo moving in the direction *MF,* if the estimated speeds of enemy and torpedo are correct. The moment that the enemy is on the proper bearing is ascertained by looking over the sights *I* and *J.* Other means of ascertaining the direction in which to fire the torpedo have superseded the torpedo director to a considerable extent, but it is still largely used in most navies.

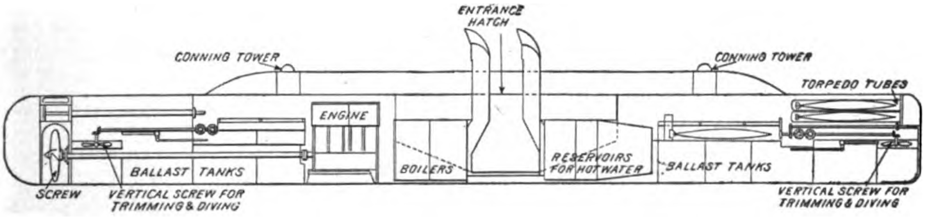
TORPEDO NET. A net made of heavy wire rings connected with one another by small steel rings and surrounding a vessel of war below water as a defense against torpedoes. The net is made up in sections about 15 by 20 feet in size, and these sections join to make the total protection, which is divided into three parts, called the main defense, bow defense, and stern defense. All except the main defense are frequently omitted, and it can be carried only if the vessel is moving slowly, while no nets are of any use if the ship is moving at fair speed. The type of net most in favor is that devised by Mr. Bullivant, an Englishman in the employ of the Admiralty. The Bullivant net is made of wire rings or grommets (see KNOTTING AND SPLICING), 6 inches in diameter, connected to each other by galvanized steel rings. Each section weighs about 400 pounds and has a heavy piece of chain at the foot to keep it as nearly vertical as possible when the ship is under way or anchored in a current; the sections are joined to each other by stout wire lashings. The upper edge of the net has small rings sliding on a wire rope, called a jackstay, which is shackled

SUBMARINE TORPEDO BOATS


DRIVING WHEEL
HAND WHEEL FOR RUDDER CONTROL
ENTRANCE HATCH
ENTRANCE HATCH
PUMP FOR DRAINING BALLAST TANKS
BALLAST TANKS
TRIMMING AND DIVING WEIGHT
WHEEL FOR MOVING TRIM.& DIV. WEIGHT.

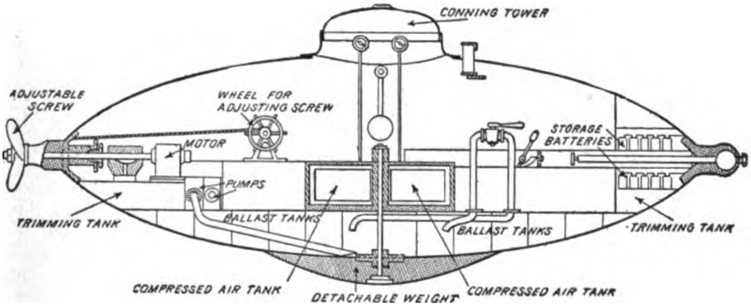
1

"PLONGEUR-MARIN"—GERMAN—1851



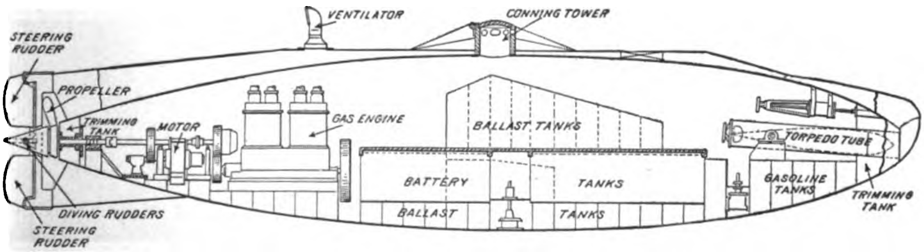
2

NORDENFELDT "No. 4"—ENGLISH—1887



3

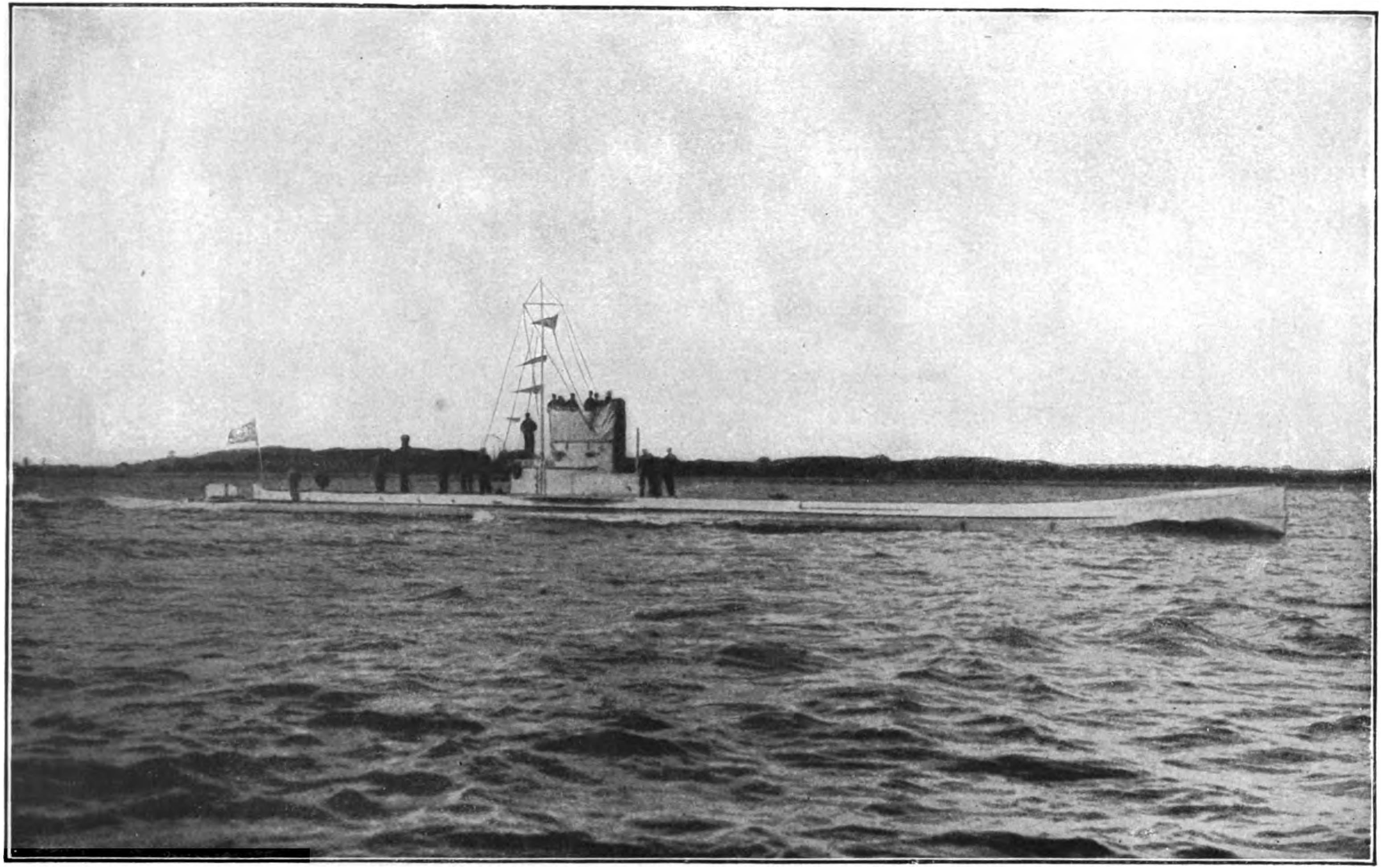
"GOUBET"—FRENCH—1889



4

HOLLAND "FULTON"—UNITED STATES—1901

SUBMARINES



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A GERMAN SUBMARINE OF 1914

to the outer ends of the booms. Each of the booms is of hollow steel tubing and is about 30 feet long. The inner end is fitted with a ring which passes through another ring at the upper end of a pivot bolt which works in a lug secured to the ship's side. The outer end is fitted with two topping lifts and two guys. The booms are placed about 45 feet apart. When not in use the booms are swung in alongside and with the net landed on a sort of shelf, or if there is no shelf the net is drawn up snugly and the whole lashed to eyebolts on the ship's side. Torpedo nets are not regarded with favor by many naval officers, as they cannot be used except when the ship is at anchor, and many torpedoes are now fitted with net cutters which enable them to get through. Nets have never been carried by United States naval vessels, and experience with them in the great war and in recent experiments have confirmed the wisdom of this practice.

TORPEDO SCHOOL. See Naval Schools of Instruction.

TORPEDO STATION. A torpedo supply station and headquarters for torpedo boats. The United States naval torpedo station is on Goat Island, Newport harbor. It consists of a torpedo factory, repair shops, buildings for the storage and care of reserve torpedoes, and a school for enlisted men in the construction, care, and operation of torpedoes, submarine mines, etc. Only a small part of the torpedoes used in the United States navy are made in the factory, the others being built by contract in private works. All torpedoes delivered under contract are sent there from the makers and are inspected, tested, and put into adjustment for service; also, all torpedoes which have been injured in service or need serious repairs. In addition, all necessary supplies for working torpedoes are made there, together with torpedo mines, guncotton, primers for heavy guns, and certain other ordnance supplies and fittings.

TORQUATO TASSO, tôr-kwä'tô täs'sô. A tragedy by Goethe (1790) suggested by a visit to Sorrento and Sicily.

TORQUAY, tôr-kē'. A fashionable health resort and watering place on the south coast of Devon, England, occupying a cove on the north side of Tor Bay, 23 miles south of Exeter (Map: England, C 6). Marble works and terra-cotta manufactures are its industrial specialties, and it is an important yachting station. It has a large harbor. Till about 1800 Torquay was an assemblage of fishermen's huts. Then its climate and freedom from fogs caused it to be resorted to by tuberculous patients; it soon attained European celebrity. St. John's, a fine church of modern Gothic architecture, the town hall, a museum, a theatre, and an opera house are the chief structures. Torquay was incorporated in 1892. Kent's Cavern, discovered in 1824, and the Brixham Cave, discovered in 1858, are rich in fossils and have supplied the earliest English evidences of prehistoric man. After the defeat of the Spanish Armada Don Pedro's galley was brought into Tor Bay, and an old thirteenth-century building, where the survivors were housed, is known as the Spanish barn. Torquay was the landing place of William of Orange in 1688. Pop., 1901, 33,625; 1911, 38,772.

TORQUEMADA, tôr'kâ-mä'dȧ, Juan de, also known by the Latinized form Turrecremata (1388–1468). A Spanish theologian and Cardinal, born at Valladolid. He entered the Dominican Order in 1403 and completed his studies at the University of Paris in 1423. After presiding over houses of his order at Valladolid and Toledo, he was made master of the sacred palace by Eugenius IV in 1431 and employed in various important negotiations. He was made Cardinal priest in 1439, later Cardinal Bishop of Albano, and in 1464 Cardinal Bishop of Sabina. The large revenues of various preferments he devoted to church building and works of charity, but attained greater renown by his numerous theological writings, many of which dealt with the controversies of the day. He took part in the councils of Constance, Basel, and Florence and drew up the plan for the union between the Greek and Latin churches at the last named. Consult S. Lederer, *Der spanische Cardinal Johannes von Torquemada* (Freiburg, 1879), and H. C. Lea, *History of the Inquisition of Spain* (4 vols., New York, 1906–07).

TORQUEMADA, Tomás de (1420–98). A Spanish Inquisitor General. He was born at Valladolid, of the same family as that to which belonged the famous theologian, Juan de Torquemada (q.v.). He entered the Dominican Order and became prior of the monastery at Segovia, a post which he held for 22 years. In 1478 the Inquisition (q.v.) was reëstablished in Spain by Ferdinand and Isabella, and four years later some assistants were given to the first inquisitors. Torquemada was among these and so distinguished himself by his zeal that in 1483 he was named by Sixtus IV Grand Inquisitor for Castile and Aragon. He erected four tribunals, at Seville, Cordova, Jaén, and Villa Real, the last of which was afterward transferred to Toledo. The Grand Inquisitor was assisted by a council of theologians and jurists named by the King, but deriving their jurisdiction from the Inquisitor General in virtue of the latter's papal authority. In political and legal questions he was obliged to act only in concert with them, but in theological matters merely asked their advice. Torquemada drew up the code of procedure, which was confirmed by the Pope, though the Holy See steadily impressed upon the inquisitors the necessity of exercising charity towards those who were accused of heresy and frequently mitigated the rigor of their sentences. Torquemada took a prominent part in the expulsion of the Jews from Spain. Towards the end of his life he retired into the Dominican monastery of Avila, where he died. Consult De Molenes, *Documents inédits: Torquemada et l'Inquisition* (Paris, 1897), and H. Gaultier de Saint-Amand, *Torquemada: Essai sur l'Inquisition d'Espagne en 1483* (Saint-Denis, 1910). As a typical representative of the Spanish Inquisition, Torquemada stands convicted of wanton cruelty on the evidence of his own code of procedure and on the evidence of the Jesuit historian Juan de Mariana (q.v.) and of the later historian Juan Antonio Llorente (q.v.), who was general secretary of the Inquisition and made a careful study of its archives.

TORQUES, tôrks (Lat. *torques*, *torquis*, twisted neck ring, necklace, collar, from *torquere*, to rack, twist, torment). A species of gold ornament, meant to be worn round the neck, which was much in use in ancient times among Asiatic and North European nations. It consisted of a spirally twisted bar of gold, bent nearly into a circle, with the ends free and terminating in hooks or sometimes in serpents. Numerous examples have been dug up in Great Britain and France.

TORRE, tôr′rȧ, DUKE DE LA. See SERRANO Y DOMÍNGUEZ.

TORRE DEL GRECO, tŏr′rȧ dĕl grä′kô. A seaport and bathing resort in the Province of Naples, Italy, situated at the base of Vesuvius, 7 miles southeast of Naples (Map: Italy, E 4). The town has been largely rebuilt since the great eruption of Vesuvius in 1861. It manufactures wine, coral ware, lava ware, and rope. There are shipbuilding yards. The inhabitants are largely engaged in the coral, tunny, oyster, and sardine fisheries. Torre del Greco suffered severely from lava streams in 1631, 1737, 1794, and 1906. Pop. (commune), 1901, 33,299; 1911, 35,320.

TORRE DELL' ANNUNZIATA, -än-nōōn′-tsė-ä′tȧ. A seaport in the Province of Naples, Italy, situated at the base of Vesuvius, 12 miles southeast of Naples (Map: Italy, E 4). It makes a specialty of macaroni. There are fine thermal baths. It has a government arms factory, extensive fisheries, and a trade in wine and lava products. Pop. (commune), 1901, 28,143; 1911, 25,070.

TORREDONJIMENO, -dŏn-ʜê-mä′nô. A town in the Province of Jaén, Spain, 8 miles west of the city of Jaén, on the right bank of the Salado de Porcuna (Map: Spain, D 4). It is a well-constructed town with regular plazas and wide streets. There are gypsum quarries in the vicinity. Spirits and soap are the chief manufactures. Pop., 1900, 10,044; 1910, 12,328.

TORRENCE, (FREDERIC) RIDGELY (1875–). An American poet, born at Xenia, Ohio, and educated at Miami University and at Princeton. He was successively a librarian in the Astor and Lenox libraries, New York, assistant editor of the *Critic,* and associate editor of the *Cosmopolitan Magazine* (1906–07). He was honored with membership in the National Institute of Arts and Letters. His work includes: *The House of a Hundred Lights* (1900); *El Dorado: A Tragedy* (1903); *Abelard and Eloise* (1907), a poetic drama; *Rituals for the Events of Life* (1910); *Three Plays for Women* (1910).

TOR′RENS, HENRY WHITELOCK (1806–52). An English writer, born at Canterbury and educated at Charterhouse and Christ Church, Oxford. He held various positions in the civil service and in 1837 became one of Lord Auckland's secretaries, but his reputation rests upon his translation of the *Arabian Nights.* The first volume appeared in 1838. The work was never completed, but the existing fragment is considered superior to any later version. His collected works were published by J. Hume in 1854 (Calcutta and London).

TOR′RENS, LAKE. A large lake depression in South Australia, situated about 35 miles north of the north extremity of Spencer's Gulf (Map: South Australia, D 2). It is about 130 miles long, with an average breadth of 20 miles, but is very shallow. In the wet season it receives a number of streams from the Flinders Range, but for a large part of the year it is only a salt marsh.

TORRENS, ROBERT (1780–1864). An Irish economist. He is best known as an economist and as one of the first to state the law of diminishing returns, the modern theories of wealth, and theory of international trade, and is credited with having proposed the separation of the Bank of England into banking and issue departments. His publications include: *An Essay on Money and Paper Currency* (1812); *An Essay on the Production of Wealth* (1821); *Letters on Commercial Policy* (1833); *On Wages and Combinations* (1834); *Tracts on Finance and Trade* (1852).

TORRENS, SIR ROBERT RICHARD (1814–84). A British colonial statesman, born at Cork, and educated at Trinity College, Dublin. In 1840 he went to South Australia, of which he became Treasurer in 1852 and, after responsible government was established, Premier and Treasurer in 1857. In the following year were passed the land laws which bear his name, whereby public registration was substituted for conveyancing. (See TORRENS SYSTEM.) In 1863 Torrens retired from Australian public life, returned to England, and in 1868 entered Parliament, where he sat for Cambridge until 1874, but failed to introduce his reform in the land laws. His publications include *The South Australian System of Conveyancing* (1859) and *Transfer of Land by "Registration of Title" as now in Operation in Australia under the "Torrens System"* (1863).

TORRENS, WILLIAM TORRENS MCCULLAGH (1813–94). An Irish politician and author, who in middle life (1863) assumed his mother's name of Torrens. He was born at Greenfield, near Dublin, was educated at Trinity College, Dublin, and was admitted to the Irish bar in 1836 and the English in 1855. In 1842 he was one of the founders of the Mechanics' Institute of Dublin. Elected to Parliament in 1847, he sat for Dundalk until 1852, was returned in 1857 for Yarmouth, but was unseated on petition, and then sat for Finsbury from 1865 to 1884. He was known for his interest in social questions. He introduced the Artisans' Dwellings Act and that by which the School Board of London was established. His publications include: *The Industrial History of Free Nations* (2 vols., 1846); *The Lancashire Lesson* (1864); *Our Empire in Asia: How we Came by it* (1872); *Memoirs of Viscount Melbourne* (2 vols., 1878); *Twenty Years in Parliament* (1893); *History of Cabinets* (2 vols., 1894).

TORRENS SYSTEM. A system of registration of titles to real estate introduced into South Australia by Sir Robert Richard Torrens in 1857 in the Real Property Act. This system of official examination and registration of titles has been adopted in England, Australia, New Zealand, British Columbia, parts of Canada, and in somewhat modified form in some of the United States and Territories including New York, Massachusetts, Illinois, California, Colorado, Oregon, Minnesota, Ohio, Washington, Hawaii, and the Philippines. The chief characteristics of the system are (1) the creation of truly indefeasible titles warranted and guaranteed by the state; (2) provisions for special proceedings by which the validity of the title is established and a governmental certificate issued attesting that fact; (3) the transfer of title to registered land by entry on the register to the exclusion of all other methods; (4) the creation of an indemnity fund to compensate those injured by the operation of the system.

England. The present English system is the result of agitation and experimental legislation of upward of 50 years. As now in force, the

English Act provides for three forms of registered titles, absolute, qualified, and possessory. The extended examination necessary to justify a certificate of absolute title and the expense attendant thereto have tended to discourage application for such titles; and the fact that a certificate of qualified title tended only to emphasize the existing defect in title had a similar effect upon applications for qualified certificates. The system has operated with considerable success in reference to possessory titles, however, in spite of the fact that the certificate issued in such applications does not affect rights existing before the time of the possession certified to and does not cut off rights to the title not yet possessory in character. In other words, such a certificate merely vests in the applicant "such title as he may have" at the time of the application.

United States. Because of the due-process clause of the Constitution of the United States, the pioneer Illinois Act of 1895 was declared unconstitutional, since it appointed a registrar of titles whose functions in effect amounted to the exercise of a judicial power. Accordingly all the registration acts now in force provide for a regular proceeding in court, brought by the person seeking to have his title registered, and effective only against persons interested upon the giving of notice as prescribed in the statute. Under the Massachusetts Act a court of land registration is established for the whole State, its sessions being held in Boston. After the completion of such a proceeding, provided the case has been properly conducted and all necessary parties served, a period, generally two years, as in the Illinois Act, must elapse before the title of the applicant becomes indefeasible. It has become customary to protect the parties during this period by the issuance of a bond. In the United States only estates in fee simple may be registered. See Conveyance; Deed; Real Property; Recording of Deeds; Title, Registration of; Title Deeds.

Bibliography. Jacques Dumas, *Registration of Title under Torrens System* (Chicago, 1900); William Niblack, *The Torrens System* (ib., 1900); id., *The Torrens System: Its Cost and Complexity* (ib., 1903); J. E. Hogg, *Australian Torrens System* (London, 1905); R. B. Morris, *Law of Land and Mortgage Registration* (ib., 1905); J. P. Kennedy (comp.), *List of References in the Torrens System of Land Registration* (Richmond, Va., 1906); William Niblack, *Analysis of the Torrens System of Conveyancing Land* (Chicago, 1912); A. G. Cameron, *The Torrens System: Its Simplicity, Serviceability, and Success* (Boston, 1915).

TORRES NAHARRO, tôr′râs nȧ-hăr′rô, Bartolomé de. A Spanish poet and dramatist, born at Torre de Miguel Sexmero, near Badajoz, towards the end of the fifteenth century. He lived at Rome and subsequently at Naples, where he published his collected works under the title *Propaladia* (1517) and dedicated them to Ferdinand d'Avalos, the husband of Vittoria Colonna. His plays have action, character, and plot and are of historic value. Torres Naharro is called the creator of Spanish comedy, but this title belongs rather to Juan del Encina. Torres Naharro can, however, be considered the first real master of the Romanesque drama, and he was the first Spanish writer who developed his plots and examined their effect on the public. He also wrote ballads, sonnets, and epistles. It was some time before his plays became known in Spain, and the first Spanish edition of them did not appear until 1520. But during the following century his works were very popular, although, owing to his manner of describing the clergy, the later editions were expurgated. Consult Torres Naharro, *La Propaladia*, edition by Manuel Cañete and Marcelino Menéndez y Pelayo (with an excellent study by the latter), in *Libros de Antaño*, vols. ix and x (Madrid, 1880, 1900).

TORRES NOVAS, tŏr′râs nŏ′väs. A town of the District of Santarem, Portugal, 56 miles northeast of Lisbon (Map: Portugal, A 3). It is in an olive-producing region and has important oil mills and cotton and linen manufactories. Pop., 1900, 10,738.

TORRES (tŏr′rĕs) **STRAIT.** The channel which separates New Guinea from the Australian continent (Map: Australia, G 4). It is about 80 miles in width. Its navigation is rendered difficult by coral reefs, sand banks, and islands. It was discovered by Torres in 1606.

TORRES VEDRAS, vā′drȧs. A town in the District of Lisbon, Estremadura, Portugal, on the left bank of the Sizandro, 24 miles northwest of Lisbon, on the Lisbon-Figueira Railroad. Pop., 1900, 6891. It carries on some trade in wine. The Lines of Torres Vedras consist of three lines of fortifications, begun by Wellington in 1809 and behind which he retired in October, 1810, before the invading army of Masséna. He held the lines against all the attempts on the part of the French and in August, 1811, forced Masséna to retreat. The first of these lines, extending from Alhandra on the Tagus to the mouth of the Sizandro on the seacoast, was 29 miles long; the second lay from 6 to 10 miles behind the first and had a length of 24 miles; the third, situated to the southwest of Lisbon, at the very mouth of the Tagus, was very short, being intended to cover a forced embarkation if that became necessary. The entire ground thus fortified was equal to 500 square miles.

TOR′REY, Bradford (1843–1912). An American ornithologist and author, born at Weymouth, Norfolk Co., Mass. He entered business in Boston, and from 1886 to 1901 was a member of the staff of the *Youth's Companion* of that city. Among his books, marked by accurate and discriminating observation and a happy style, are *Birds in the Bush* (1885; 8th ed., 1895); *A Rambler's Lease* (1889); *Spring Notes from Tennessee* (1896); *A World of Green Hills* (1898); *Every-Day Birds* (1901); *The Clerk of the Woods* (1903); *Nature's Invitation* (1904); *Friends on the Shelf* (1906); *Field Days in California* (1913).

TORREY, Charles Cutler (1863–). An American Semitic scholar, born at East Hardwick, Vt. He graduated from Bowdoin College in 1884, from Andover Theological Seminary in 1889, and from the University of Strassburg (Ph.D.) in 1892. He was afterward instructor and professor of Semitic languages at Andover until 1900, when he accepted a like chair at Yale. In 1900–01 he was director of the American School of Archæology in Jerusalem, and in 1906 he became chairman of the managing committee of this school. He served as coeditor of the *Journal* of the American Oriental Society. His publications include: *The Commercial-Theological Terms in the Koran*

(1892); *The Composition and Historical Value of Ezra-Nehemiah* (1896); *The Mohammedan Conquest of Egypt and North Africa* (1901); *Selections from Bokhari* (1906); *Ezra Studies* (1910).

TORREY, Charles Turner (1813–46). An American reformer, born at Scituate, Mass. He graduated at Yale in 1830, studied theology, and became pastor of a Congregational church in Princeton, N. J. Later he had charge of a church at Salem, Mass., but finally gave up his pastoral duties to devote himself to the abolitionist movement. He removed to Maryland, and in 1843, for writing an account of a slaveholders' convention held at Baltimore, he was arrested and imprisoned. He aided fugitives by the underground railroad and in 1844 was convicted of having attempted to help slaves to escape and was sentenced to a long term in the State penitentiary. Two years later he died in prison of consumption. His body was taken to Boston, where it was given a public funeral. He was hailed as a martyr in the antislavery cause.

TORREY, John (1796–1873). An American botanist. He was born in New York State; graduated at the New York College of Physicians and Surgeons (1818); was professor at West Point (1824–27); in the College of Physicians and Surgeons (1827–55); at Princeton (1830–54); chief assayer in the United States Assay Office, New York (1853–73). In 1855 he was president of the American Association for the Advancement of Science. His best-known publications are: *Catalogue of Plants Growing Spontaneously within Thirty Miles of New York* (1819); *Flora of the Northern and Middle States* (1824); *Flora of the State of New York.* With Prof. Asa Gray he began the publication of *Flora of North America* (1838–43). His valuable herbarium and botanical library he presented in 1860 to Columbia College, in which institution he held a professorship of chemistry at the time of his death. A noted botanical club has been named for him.

TORREY, Joseph William (1828–84). An American newspaper man and merchant, born at Bath, Me. He was for a time connected with the Boston *Times* and the *Carpet Bag.* In 1853 he went to Australia, where he entered a commercial house, and in 1859 to China, where he became editor of the Hongkong *Times* and the *China Mail.* He engaged in commerce, organized the American Trading Company of Borneo, and in 1865 was recognized by the Sultan as Rajah of the Marudu and Ambong districts. He retained the position until 1879, when he became Secretary of the American Legation at Bangkok. He returned to the United States in 1883.

TORREY, Reuben Archer (1856–). An American evangelist, born at Hoboken, N. J. He was educated at Yale (A. B., 1875; B.D., 1878) and at Leipzig and Erlangen (1882–83). Ordained to the Congregational ministry in 1878, he was city missionary in Minneapolis, Minn., for some years and then became associated with the work of Dwight L. Moody, serving as superintendent of the Moody Bible Institute from 1889 to 1908. Besides preaching in many American cities he made a world evangelistic tour in 1902–03 and held meetings in Great Britain in 1903–05 and 1911. His writings include: *What the Bible Teaches* (1898); *How to Work for Christ* (1901); *Revival Addresses* (1903); *How to Promote and Conduct a Successful Revival* (1901; new ed., 1906); *Anecdotes and Illustrations* (1907); *Studies in the Life and Teachings of Our Lord* (1909); *The Person and Work of the Holy Spirit* (1910); *The Return of the Lord Jesus* (1913).

TOR'REYA (Neo-Lat., named in honor of John Torrey). A genus of conifers belonging to the Taxineæ, or yew tribe, and comprising four species of remarkable distribution. All of the species are very local, but very widely separated, occurring in restricted localities in Florida, California, Japan, and China. The California species known as Californian nutmeg is the largest, reaching a height of 70 feet and occasionally 100 feet.

TORREY BOTANICAL CLUB, The. A scientific society in New York City, incorporated in 1871 and now one of the six associated societies forming the Scientific Alliance (q.v.). It has a valuable herbarium of several thousand specimens, illustrating the flora within 100 miles of New York, exhibited at the museum of the New York Botanical Garden, which is the home of the club. The membership in 1916 was about 400, of whom 300 were active members. The club publishes the *Bulletin, Torreya,* and *Memoirs.*

TORRIANI, Maria Torelli-. See Torelli-Torriani, Maria.

TORRICELLI, tôr'rê-chĕl'lê, Evangelista (1608–47). An Italian mathematician and physicist, born at Piancaldoli or, according to some authorities, at Modigliana in the Romagna. From about 1628 he studied mathematics in Rome, under Benedetto Castelli (1577–1644), the favorite disciple of Galileo. Galileo's theories on force and motion especially engaged his attention and led to his publishing a *Trattato del moto* (1641), a meritorious work, but containing few new discoveries of consequence. He was then invited by Galileo to visit him at Florence, and aided the old philosopher, now blind, in the preparation of his *Discorsi.* On Galileo's death he was appointed his successor in the chair of philosophy and mathematics at Florence. Torricelli was the first to use a column of mercury in a tube closed at one end to balance the pressure of the atmosphere, and found that a much shorter column could be used than in the case of water, as in Galileo's experiment. This feat, actually performed in 1643 by his assistant, Viviani, furnished him with the idea of the barometer (q.v.) in which the space above the mercury in the closed tube has since been known as a Torricellian vacuum. Torricelli also effected the quadrature of the cycloid, but in this he was anticipated by Roberval. He was also the first to construct a simple microscope and improved the telescope. In 1908 was celebrated in Italy the third centenary of Torricelli's birth, and interesting memorials were published reproducing his original work.

TORRIGIANO, tôr'rê-jä'nô, Pietro (also Torrigiani and Torregiani) (c.1472–1528). A Florentine sculptor of the late Renaissance. He was born in Florence and studied under Bertoldo in the Giardino Medici, where in a jealous rage he broke the nose of his fellow pupil, Michelangelo, thereby permanently disfiguring him. He was afterward taken by Florentine merchants to London, where he worked for King Henry VIII, executing the stately tomb of Henry VII and his Queen (1518) in Westminster Abbey.

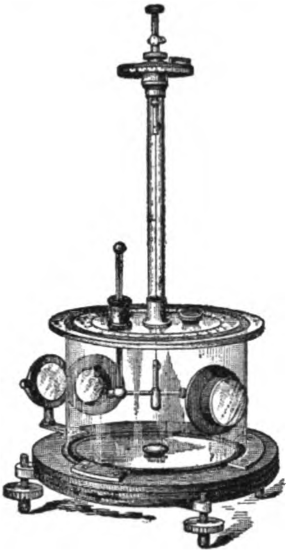
He also designed there a bronze monument for the Duchess of Richmond, and the tomb of Dr. Young in the Rolls Chapel, Chancery Lane. Later he went to Spain, where he executed commissions for the cathedral of Seville and modeled the fine statue of St. Jerome (now in the Museum, Seville). Imprisoned by the Inquisition for destroying a statue of the Virgin for which he considered himself underpaid, Torrigiano starved to death in confinement. His work is in the light decorative style of the late Quattrocento, but shows greater emphasis on the architectonic structure.

TOR′RINGTON. A town in Litchfield Co., Conn., 35 miles by rail west of Hartford, on the Naugatuck River, and on the New York, New Haven, and Hartford Railroad (Map: Connecticut, C 2). It has a public library, the Hungerford Hospital, and a fine municipal building. Torrington is extensively interested in manufacturing. The leading products are brass articles, hardware, needles, skates, novelties, woolen goods, gasoline engines, and machine tools. Pop. (town), 1900, 12,453; 1910, 16,840; 1915 (U. S. est.), 19,153. Torrington was settled in 1737 and was incorporated in 1740 as a town and in 1887 as a borough. Consult Samuel Orcutt, *History of Torrington* (Albany, 1878).

TORRINGTON, FREDERICK HERBERT (1837–). A Canadian musician, born at Dudley, Worcestershire, England. In 1853 he became organist at St. Anne's, Bewdley, and in 1857–69 was organist at Great St. James's Street Methodist Church in Montreal, Canada. He was organist and musical director at King's Chapel, Boston, in 1869–73, and also professor in the New England Conservatory of Music; in 1873–1907 he was organist and choirmaster at the Metropolitan Church at Toronto, Canada, and conducted the Philharmonic Society there. He founded in 1886 the first Toronto musical festival and in 1888 instituted the Toronto College of Music. He also conducted Toronto musical festivals in 1895 and 1896. In 1903 he was associate conductor, with Sir Alexander Campbell Mackenzie (q.v.), of the cycle of musical festivals in that city. He was elected president of the Canadian Society of Musicians in 1892. Among his works are organ music, choruses, hymn tunes, and services.

TORRINGTON, VISCOUNT. See BYNG, GEORGE.

TOR′SION BALANCE. An instrument originally designed by the Rev. John Mitchell and after his death improved by Henry Cavendish, who used it in performing the well-known Cavendish experiment of determining the mass of the earth. The apparatus was reinvented by Coulomb and is often known by his name, having been used by him to study electrical and magnetic attractions. It consists of a horizontal rod suspended by a fine wire or, in the most recent experiments, a fibre of quartz and carrying at either end two small spheres having a mass equivalent to one gram. Adjacent to but on opposite sides of these small masses are two large spheres of lead which attract the two smaller masses and cause the horizontal rod to deflect, the movement being observed by a mirror and telescope and scale as in the case of the reflecting galvanometer. The force of attraction between two different masses can thus be ascertained, and, as the attraction of the earth for a unit mass as well as its radius is known, we can thus determine the mass of the earth. In electricity charged conductors were substituted for the masses, and to study the strength and action of magnetic poles a long thin magnet was suspended and a similar magnet placed in a vertical position near one of its poles. The amount of force exerted was ascertained by finding the angle through which it was necessary to turn the head carrying the wire in order to keep the suspended bar at its original position. The Cavendish experiment enables the physicist to compute the mass of the earth and to determine also its mean density, which according to Boys is 5.5268.



TORSION BALANCE.

TORSK (Norw., Dan., Swed. *torsk*, connected with Eng. *thirst*), or CUSK. A small cod (*Brosmius brosme*) of the European side of the North Atlantic, taken in deep water and regarded as valuable. It is usually about 20 inches long and is distinguished by its long dorsal fin and yellow color.

TOR′SO (It., stump, trunk). An ancient statue of which only the body remains. Of such imperfect relics of classic art, the most famous is the *Torso of the Belvedere* in the Vatican, the work of Apollonios, son of Nestor, an Athenian. It is a masterpiece of the later Greek sculpture (first century B.C.), showing a thorough mastery of the treatment of the nude in all its details, though without the ideality of the best period. It represents a man of gigantic build, seated on a rough rock over which a skin is thrown. It is usually called Hercules, though Sauer prefers to consider it Polyphemus. No successful or convincing restoration has yet been made. The common story that it was discovered in the Campo del Fiore at the beginning of the sixteenth century and placed by order of Pope Julius II in the Vatican, is certainly wrong. It is only known that it was formerly in the possession of the Colonna family and was brought to the Vatican by Pope Clement VII (1523–34). Consult Loewy, *Inschriften der griechischen Bildhauer*, No. 343 (Leipzig, 1885), and B. Sauer, *Torso von Belvedere* (Giessen, 1894).

TOR′STENSON, LENNART, COUNT OF ORTALA

(1603–51). A Swedish general, born at Torstena, West Gothland, Aug. 17, 1603. He became a royal page in 1618 and attended Gustavus Adolphus in most of his earlier campaigns. When Gustavus entered Germany in 1630, Torstenson was captain of the bodyguard; and the brilliant services he rendered were rewarded with rapid promotion. In 1641, on the death of Banér, he was appointed to the command of the Swedish forces in Germany. He invaded Silesia in May, 1642, routed the Imperialists at Glogau and Schweidnitz, reduced most of Moravia, and being pressed back into Saxony by the Archduke Leopold William and Piccolomini, turned upon his pursuers (Nov. 2, 1642) and signally defeated them on the historic field of Breitenfeld. He then laid Moravia and Austria under contribution. The Emperor, Ferdinand III, despairing of protecting his territories from Torstenson, negotiated with Christian IV of Denmark to make a diversion by invading Sweden; but Torstenson with characteristic promptitude left Moravia in September, 1643, traversed Saxony, burst into Holstein, and in less than six weeks subjugated the Danish mainland. The Imperialists under Gallas followed him to aid their allies, but arrived too late and were routed and driven into Saxony, and again totally defeated at Jüterbog in attempting to bar Torstenson's return into Bohemia (1644). The Swedish general won a great victory over Hatzfeld at Jankau (March 6, 1645) and carried his arms to the Danube. The Emperor was compelled to flee from Vienna, the Saxons again joined the Swedes, and the Danes, routed at sea as well as on land, sought peace. In 1646 disease compelled Torstenson to resign the command and retire to Sweden, where he was created Count and appointed to various high offices. He died at Stockholm, April 7, 1651. Consult De Peyster, *Torstenson* (New York, 1886). See Thirty Years' War.

TORT (Lat. *torquere*, to twist, OF. *torte*, twisted). A civil wrong. A short and exact definition of tort is not possible. Legal authorities have attempted such definition, but unsatisfactorily, as "a wrong independent of contract." Yet the assault on a passenger by the employee on a street car gives rise to an action in tort and an action for breach of the contract of transportation. The elements of a tort are that it consists of the breach of a legal duty which may have been created by contract or implied by law, and such duty must be owing to the party injured. It is distinguished from contracts in its nature in that it involves a greater amount of moral turpitude. The very names of the principal torts connote wrong, such as slander, fraud, negligence, and conversion (q.v.). An action in tort usually carries with it the right to arrest the defendant. It differs from a crime, as it is an offense against an individual, while a crime is an offense against the state. It is one of the earliest branches of law, as undoubtedly in primitive communities the settlement of active disputes was one of the first functions of authority, while contract rights, breaches of agreement, were left to the individuals. Later, as acts tended to become breaches of the peace, the state assumed them to be offenses against itself. The distinction between contracts, torts, and crimes has, even in modern communities, not been clearly held. The law of torts is itself constantly changing. With changing social conditions and the recognition of altered obligations new legal duties of one individual to another are defined. Acts which were not torts have become so. For example, at common law the landlord owed little or no obligation to repair. The roof of the house might fall in or the stairs give way, and the landlord was not liable, but under modern conditions, where frequently a number of tenants dwell in a tenement house, statutes impose a duty on the landlord; the theory being that the landlord exercises supervision and control over the roof and hallways used by the tenant jointly, no responsibility resting on the individual tenant. The landlord therefore is held liable for injuries in an action in tort, for negligence in failure to make repairs, after notice. A branch of the law of tort which is not settled and is yet in process of change is that of what is known as "unfair competition." Another example of the change of the law of torts with altered social conditions is the modern recognition by statutes of the obligation of employers in regard to accidents to their employees. The essential element of legal duty should be distinguished from moral duty. Thus, a man's property may be injured by fire which a bystander could have extinguished or prevented at little risk. No cause of action would lie for the neglect of the bystander because he was under no legal obligation to act. Thus, many accidents happen and injuries result for which no remedy exists. But where a right of action does exist damages are not confined to those which the law would recognize in an action on contract, and exemplary damages may be recovered. A classification of the principal torts has been attempted on the basis of the nature of the injuries. Injuries to property are such as conversion, trespass, nuisance; to person, negligence, assault; to feelings, such as injuries to reputation, libel, slander, alienation of affection, and seduction (q.v.). As a general rule the party must elect whether to sue on a contract or a tort. An example of the same act which is both a breach of contract, a tort, and a crime, is that of the misappropriation of funds by a trustee. It is a breach of the contract of trust; it is a tort, conversion; and it is a crime, embezzlement. The law will award damages for the breach, equity will follow the misappropriated funds and allow arrest of the defendant, and the state will punish for the crime. Another act which may be given as an example is that of criminal libel. The libel may be of such a nature that it is punishable by the state as a crime, and at the same time give a right of redress to the individual in tort. See Campbell's (Lord) Act.

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TORTICOLLIS. See Wryneck.

TORTOISE, tôr'tŭs, -tĭs (OF. *tortue, tortugue.*

Fr. *tortue*, tortoise, from Lat. *tortus*, twisted, so called from its crooked feet; termination influenced by Eng. *porpoise*). A turtle of terrestrial habits. The term is indefinite, but usually distinguishes land chelonians from marine species, although tortoise shell is exclusively a marine product, and certain fresh-water turtles, as the terrapins, are spoken of as marsh tortoises. Its most exact application is probably to the family Testudinidæ, in which the shell is always covered with well-developed horny shields. It includes the terrapins or aquatic mud turtles of the genera *Emys*, *Chrysemys*, and similar groups, in which the feet are adapted for both walking and swimming and the carapace is often ornamented by gay colors or sculpturings. Many are almost wholly terrestrial, as is the case with the common box tortoise (see Turtle) of the United States. Near allies are the famous Greek tortoise of the Mediterranean region and many other species of the typical genus *Testudo;* also the Florida gopher. See Gopher Tortoise.

The most important and distinctive members of the group are the gigantic land tortoises of various oceanic islands, now extinct or nearly so. (See Extinct Animals.) All these belong to the genus *Testudo* and differ little except in size from the other members of the family. Some of them are not larger than other large turtles, but those most noted greatly exceed any other living forms, although surpassed by the *Testudo atlas* of the early Pliocene in India, whose shell was 6 feet or more in length. Others, with shells about 4 feet in length, were its contemporaries in Europe and in North America. Their representatives survived until a recent date or still live in the Galápagos Islands, Madagascar, and the Mascarene Islands, but nowhere upon any continent.

Specimens of small species have been known to live more than 100 years and one, at least, more than 150 years. The Madagascar species (*Testudo grandidieri*) became extinct probably before that island was discovered by white men, but at least two species of the Camoros have remained until within historic times. One (the elephant tortoise, *Testudo gigantea*, see Land Tortoise) is now extinct in its original home, the North Island of Aldabara, but preserved in the Seychelles, and a specimen living in England in 1897 then measured 52¼ × 50 inches over the curve of its shell and weighed 358 pounds; another in St. Helena was more than a century old in 1900. Daudin's tortoise, of South Aldabara, also survives in small numbers, and several were taken to Europe in 1895, one of which, at least 100 years old, had a shell 55 inches long. Several other species, probably or surely extinct, inhabited Rodriguez and other islands of the Indian Ocean, where they were found in abundance by the early voyagers and planters, but were slaughtered for food or as curiosities.

The Galápagos Islands had several species of similar gigantic tortoises, one to each island of the archipelago, which differed from the Eastern ones mainly in having longer necks and smaller heads. Some were long ago exterminated by man or by the pigs which Ecuadorans turned loose upon the islands a century ago; others still survive in small numbers, although in 1893 and again in 1898 large numbers were taken away and distributed to zoölogical gardens in various parts of the world, New York and Washington getting several old and young specimens. The largest collection of all living species is that at Tring Park, England, where the biggest known Galápagos tortoise (*Testudo elephantopus*) is one measuring 56 × 49 inches over the curve of its carapace, which was taken from Duncan Island in 1813 to Rotuma, thence to Sydney in 1880, and finally to England.

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TORTOISE BEETLE, or Shield Beetle. A leaf beetle of the subfamily Cassidinæ. The adults are rounded convex beetles with a curious marginal expansion of the upper surface and with the power of withdrawing the head into the thorax, which gives them a resemblance to a tortoise. Their larvæ are flattened, fringed with spines, and the anal end of the body is provided with a forked appendage which is bent forward over the back; to this are attached the cast-off skins of the larvæ and their excrement as a protective covering. A remarkable group of tortoise beetles, belonging to the genus *Porphyraspis*, cover themselves in the larval state with a dense coat of fibres of the palm tree, upon which they live, each of the fibres being many times the length of the insect's body and elaborately curved so as to form a round nest under which the larva lives. Many species have a brilliant golden-green or iridescent metallic coloring which disappears after death, but may be restored by moistening the dead insect. Several very beautiful species occur upon the morning-glory and upon sweet potato (see Sweet-Potato Insects), a large species (*Physonata unipunctata*) feeds upon the wild sunflower, and a very common brick-red species (*Chelymorpha argus*) feeds upon the milkweed. See Plate of Beetles.

TORTOISE PLANT. See Hottentot Bread.

TORTOISE SHELL. The semitransparent and beautifully mottled material of the scales covering the carapace of the hawksbill (q.v.), a marine turtle found in all tropical seas. In this species the 13 shield plates do not join at the edges, but overlap posteriorly; the larger central ones are broadly triangular in outline, keeled, and 6 or 7 inches broad, and those of a large turtle may weigh eight pounds. They are rarely thick enough to serve the ornamental purposes to which tortoise shell is usually applied, but when heated in oil or boiled in water may be welded together under pressure, or molded into a form which will be retained when cooled. "In genuine articles of Oriental manufacture these welds can generally be detected, or their compound nature is indicated by the beautiful pattern, which is too regular in the imitations now common." Even the shavings and fragments are welded into serviceable pieces. The turtles are taken usually when they come ashore to lay their eggs; and the plates are (or were) sometimes removed by roasting the living animal until they were loosened and could be torn off. This cruel process injures the shell. The proper way is to kill the turtle and then detach the plates by immersion in boiling water. In its nature and chemical composition the material closely resembles horn (q.v.). The use of tortoise shell has long been known. Julius Cæsar found great quantities of it in the storehouses of Alexandria. The Romans veneered furniture with it. In modern times, in addition to comb making, tortoise shell is made into cardcases, trays, handkerchief boxes, and various other articles of ornament and the toilet. It is used still to inlay expensive furniture, the Chinese and Japanese producing the most complicated and beautiful examples of this sort of art.

TORTOISE-SHELL BUTTERFLY. Any one of the butterflies of four or five common American genera. They are usually of medium size and have the wings on the upper side of some shade of black or brown marked with red, yellow, or orange. The commonest species in the eastern United States are the following: *Euvanessa antiopa*, sometimes called the mourning cloak (q.v.) and in England known as the Camberwell beauty. *Aglais milberti* is common in the northern United States and Canada. Its caterpillars feed upon the nettle plants of the genus *Urtica*. *Eugonia californica* is confined to California and in the larval stage feeds upon *Ceanothus*. *Eugonia j-album*, the Compton tortoise, is a northern species whose larvæ feed upon willows.

TORTO'LA. One of the Virgin Islands (q.v.).

TORTONA, tôr-tō'nȧ. A town in the Province of Alessandria, Italy, on the Scrivia, 12 miles east of Alessandria (Map: Italy, B 2). It has a ruined castle overlooking the town. The town manufactures silk, markets grain and wine, and quarries stone. Tortona was destroyed by Frederick Barbarossa in the twelfth century for its allegiance to the Guelphic cause. Pop. (commune), 1901, 17,425; 1911, 20,151.

TORTOSA, tôr-tō'sȧ. A fortified town of Spain, Province of Tarragona, 42 miles from the city of Tarragona, picturesquely situated on a sloping eminence overlooking the Ebro, from the mouth of which it is distant about 22 miles, and which is navigable to this town for vessels of light draft (Map: Spain, F 2). The town has a cathedral with fine carved work and marbles. There are manufactures of rope, paper, leather, soap, and pottery, of palm leaf and feather grass, but the fisheries give employment to most of the people. In the vicinity are ruins of a Roman city. Pop., 1900, 24,306; 1910, 28,097.

TORTRIC'IDÆ. See LEAF ROLLER.

TORTUGA, tôr-tōō'gȧ, or **TORTUE,** tôr-tụ'. An uninhabited island off the north coast of Haiti, West Indies (Map: West Indies, D 2). Area, about 80 square miles. Its surface is broken. It was formerly occupied by buccaneers and produced sugar, tobacco, etc.

TORTUGAS, tôr-tōō'*gaz*. A group of islands off the coast of Florida. See DRY TORTUGAS.

TORTURE (Lat. *tortura*, a twisting, torture, from *torquere*, to rack, twist, torment). The infliction of severe bodily pain either as punishment or for purpose of revenge or for the purpose of compelling the person tortured to give evidence or make confessions in judicial proceedings. Among primitive and savage peoples torture has been used as a means of ordeal (q.v.) and as a means of punishing captured enemies. During the Middle Ages the Church made use of torture as a means of compelling religious conformity and for the purpose of extorting evidence in heresy trials. Throughout southern and western Europe the most extreme cruelties were practiced for this purpose (see INQUISITION), and it was not until 1816 that torture was finally prohibited by papal bull. Examination by torture, otherwise called "the question," has been largely used in many countries as a judicial instrument for extracting evidence from unwilling witnesses or confessions from accused persons. In ancient Athens slaves were always examined by torture, and their evidence seems on this account to have been deemed more valuable than that of freemen. No free Athenian could be examined by torture, but torture seems occasionally to have been used in executing criminals. Under the Roman Republic only slaves could be legally tortured, and, as a general rule, they could not be tortured to establish their master's guilt. Under the Empire, however, torture, besides being much used in examining slaves, might by order of the Emperor be inflicted even on freemen, to extract evidence of the crime of *læsa majestas*, a prerogative frequently exercised by the Roman emperors. Cicero and other enlightened Romans condemned its use. Until the thirteenth century torture seems to have been unknown to the canon law; about that period the Roman treason law began to be adapted to heresy as *crimen læsæ majestatis Divinæ*. A decree of Pope Innocent IV in 1282, calling on civil magistrates to put persons accused of heresy to the torture to elicit confessions against themselves and others, was probably the earliest instance of ecclesiastical sanction being extended to this mode of examination. Gradually the ecclesiastical courts developed from the Roman law and applied a system of torture which reached its culmination in the atrocities of the Inquisition. The influence of the Church during the Middle Ages undoubtedly contributed to the adoption of torture by the civil tribunals. It was early adopted by the Italian municipalities, but its introduction into western Europe as an instrument of judicial inquisition as distinguished from the ordeal or compurgation was slow. It first appeared in France in the latter part of the thirteenth century and in Germany in the fifteenth century and ultimately became a part of the legal system of every European nation except Sweden and England. The use of torture seems to have been repugnant to the genius of the law of England, and it never became a part of the common law, although its use by exercise of the royal prerogative was lawful both in state trials and in the case of ordinary crimes. The first instance we have of its use is in 1310, in aid of the ecclesiastical law, during the struggle between Pope Clement V and the Templars. Edward II, when applied to to sanction the infliction of torture by the Inquisitors in the case of certain Templars accused of heresy and apostasy, at first refused; but on a remonstrance by Clement he referred the matter to the Council; and on the recommendation of the Council the Inquisitors were authorized to put the accused to the torture, but without mutilation or serious injury to the person, or effusion of the blood. During the Tudor period the Council frequently assumed the power of directing torture warrants to the lieutenant of the Tower and other officers both against state prisoners and those accused of other serious crimes; and similar warrants were at times issued under the sign manual. Under James I and Charles I torture was less resorted to and only in state trials. In 1628, in the case of Felton, the assassin of the Duke of Buckingham, the judges declared the examination of the accused by torture, for the purpose of discovering his accomplices, to be illegal. The last recorded instance of the use of torture in England was in the reign of Charles I (1640) to compel a confession of treason. The use of torture was never legal in the English colonies, and the few instances of torture in the American colonies were properly forms of execution, or the infliction of *peine forte et dure* (q.v.) as a means of compelling the defendant to plead to an indictment.

Even during the period when the use of torture was most prevalent its cruelty was recognized and its employment deplored as an evil necessary to the due administration of justice. In all ages there have been leading writers and thinkers who denounced the use of torture, not only because of its cruelty and its debasing effect upon public morals, but because of its unreliability as a means of discovering the truth, since it oftentimes led the innocent from weakness and exhaustion to plead guilty or accuse others of crimes which had not been committed. The horrors of the Inquisition and the excessive use of judicial torture from the fourteenth to the sixteenth century led to a gradual but nevertheless progressive change of public sentiment, which ultimately caused its disuse in all the countries of Europe. The use of torture was abolished in Prussia, Saxony, Austria, and Switzerland by the middle of the eighteenth century. Its use in Russia was limited by command of Catharine II in 1762 and finally abolished in 1801. In France it was abolished in 1789 (although temporarily restored by the Bourbons in 1814), in Württemberg in 1806, in Bavaria in 1807, in Hanover in 1822, and in Baden in 1831.

The instruments and methods of judicial torture have been numerous. Among the Greeks torture was inflicted by the rack (q.v.), the scourge, by thrusting the victim bent double into a vault which compelled him to retain that position until his suffering became extreme, by the injection of vinegar into the nostrils, and by the application of fire. The Romans also made use of the rack, torture by fire, the scourge, and mutilating the flesh by hooks. The wheel, upon which the victim was bound and his bones broken by the gradual application of force, was also used throughout the Middle Ages. Among the lesser tortures may be mentioned the thumbikins, boots, pincers, and manacles; and in England an instrument corruptly called the scavenger's daughter, the invention of Sir William Skeffington (or Skevington), lieutenant of the Tower in the reign of Henry VIII. This enumeration, however, by no means includes all the methods, ingenious and unspeakably cruel, by which torture was inflicted upon innumerable victims during the Middle Ages. Consult: David Jardine, *Reading on the Use of Torture in the Criminal Law of England* (London, 1837); Sir J. F. Stephen, *History of the Criminal Law of England* (3 vols., ib., 1883); H. C. Lea, *Superstition and Force* (4th ed., Philadelphia, 1892).

TO′RUS (Lat., *protuberance*, mattress, bed). A convex molding having a semicircular profile; a larger form of the bead. Its principal use is in base moldings of all kinds in classic and neoclassic architecture; notably the circular tori of the Doric, Attic, and Corinthian bases. See Base; Molding.

TO′RY (from Ir. *toridhe, tornidhe, tornighe*, pursuer, plunderer, from *torighim*, to fancy, pursue). The name of one of the historic parties in England. It was originally the term applied to Irish brigands and about the year 1680 was given as a nickname to the supporters of the Duke of York, afterward James II, when his exclusion from the succession on account of his (Catholic) religion was proposed by Shaftesbury. It was intended to imply that those who opposed the exclusion were papists. About 1830 the name Conservative began to take the place of Tory. In the United States during the Revolution the adherents of the crown were called Tories. See Loyalists; Whig and Tory.

TORY, Henry Marshall (1867–). A Canadian educator. He was born at Guysboro, Nova Scotia, and graduated at McGill University in 1890. He studied theology at the Wesleyan Theological College, Montreal, entered the Methodist ministry in 1889, but retired in 1893. He was lecturer in mathematics at McGill in 1893–1902 and then associate professor until 1908, and in the latter year was appointed president of the newly established Provincial University of Alberta at Strathcona. He published *A Manual of Laboratory Physics* (1902).

TORZHOK, tôr-zhôk′. An old district town in the Government of Tver, Russia, situated on the Tvertza, 294 miles southeast of St. Petersburg (Petrograd) (Map: Russia, E 3). In its vicinity lace and gold and silver embroideries are extensively produced by peasant women. In the tenth century Torzhok was a dependency of Novgorod. Pop., 1910, 13,723.

TOSCA. An opera by Puccini (q.v.), first produced in Rome, Jan. 14, 1900; in the United States, Feb. 4, 1901 (New York).

TOSCANELLI DAL POZZO, tôs′kȧ-nĕl′lê dȧl pŏt′sô, Paolo (1397–1482). An Italian astronomer and geographer, born at Florence. Through the accounts of Marco Polo and other travelers he came to believe that India could be reached by an ocean voyage to the West. In 1474 he imparted his views by letter to Columbus, and also to the King of Portugal. It is doubtful if Toscanelli was the first to suggest the idea of a sea journey to the West to Columbus, although he may have strengthened Columbus' determination to carry out his plans. Consult Henry Vignaud, *Toscanelli and Columbus* (New York, 1902).

TOSCANINI, tôs′kȧ-nē′nê, Arturo (1867–). An Italian orchestral conductor, born at Parma. He received his education at the Conservatory of Parma, studying piano, cello, and composition. Having made his début as operatic conductor at Turin, he was engaged for the Dal Verme in Milan. There his brilliant work attracted such general attention that Gatti-Casazza (q.v.), who assumed the directorship of La Scala in 1895, secured his services. In this position he found ample opportunity to display his genius as operatic and symphonic conductor. From 1908 to 1915 he was principal conductor at the Metropolitan Opera House in New York. Through consummate musicianship, a magnetic and authoritative personality, and dignified reserve, he gained a strong hold upon his artists as well as his audiences. As a builder of tremendous climaxes he had no superior and few equals. He directed without score a repertory of almost 100 operas of all nationalities and schools and, in addition, an extensive concert repertory. Even during rehearsals he conducted by memory.

TOSCHI, tŏ'skė, Paolo (1788–1854). An Italian engraver, one of the last representatives of the old school of line work. He was born at Parma, went to Paris in 1809 to study engraving under Bervic, with whom he remained until 1819, when he returned to Parma, founded a school of engraving, and was appointed director of the Academy of Fine Arts. His best-known engravings are from Gérard's "Entrance of Henry IV into Paris" (1818); Daniele da Volterra's "Descent from the Cross"; Raphael's "Spasimo" (Madrid); Correggio's "Madonna della Scodella," and a series of that master's Parmesan frescoes. His work is solidly and carefully executed, but without brilliancy or originality.

TOSSING THE CABER. See Caber, Tossing the.

TOSTI, tŏ'stė, Sir Francesco Paolo (1846–). An Italian-English song composer, born in Ortona di Mare in the Abruzzi. After studying at the Naples Conservatory he was appointed an instructor there. He resigned in 1869, went to Rome and appeared in concerts as a singer, after which he was made vocal instructor at the court, Rome. In 1875 he went to London and in 1880 was appointed singing teacher to the royal family. He was knighted in 1908. In 1913 he returned to Italy, making Rome his permanent residence. His numerous English and Italian songs have become exceedingly popular.

TOS'TIG (died 1066). A powerful English earl, brother of King Harold II. He was probably the third son of Earl Godwin and shared in his father's banishment, returning with him in 1052. Edward the Confessor was very fond of Tostig, and when Earl Siward died, in 1055, Tostig received Northumbria, Northamptonshire, and Huntingdonshire. Tostig proved an able and energetic ruler, restoring security to the disordered country. But his tyranny alienated the Northumbrians, and in 1065 they declared Tostig an outlaw and chose Morkere in his place. Harold sided with the rebels against his brother, and as a result Tostig was banished, though Edward regretted it exceedingly. In 1066, when Harold had succeeded Edward the Confessor as King of England, Tostig offered his support to William of Normandy. This offer was accepted, and Tostig thereupon went to King Harald Haardraade of Norway and induced him to make an invasion into England. But on Sept. 25, 1066, King Harold met them at Stamford Bridge and totally defeated them. Harald Haardraade and Tostig were both slain. Consult E. A. Freeman, *History of the Norman Conquest*, vols. ii and iii (3d ed., Oxford, 1877). See Harold II.

TOTAL ABSTINENCE. See Temperance.

TOTANA, tō-tä'nȧ. A town of the Province of Murcia, Spain, 24 miles southwest of the town of that name (Map: Spain, E 4). A gorge divides the town into two parts, the Barrio de Sevilla and the Barrio de Triana. The town is celebrated for its oranges, the mining of saltpetre, linen spinning, and especially for its tinajas (terra-cotta jars), widely used for holding oil and wine. Water is brought to the fountains by an aqueduct 7 miles long. Pop., 1900, 13,714; 1910, 13,591.

TOTARA. See Podocarpus.

TO'TEMISM (irregularly derived from Algonquin *ototeman*, his brother-sister kin). An association between a form of social organization and a form of worship. Complex ethnological phenomena, such as totemism, cannot be readily defined; thus, any definition of totemism, including the one proposed above, can give but an inadequate idea of the institution. A brief generalized description of the content of totemism, on the other hand, may prove of considerable service. A tribe or group of tribes which have totemism may be said to comprise a totemic complex. The essential aspects of a totemic complex are three in number:

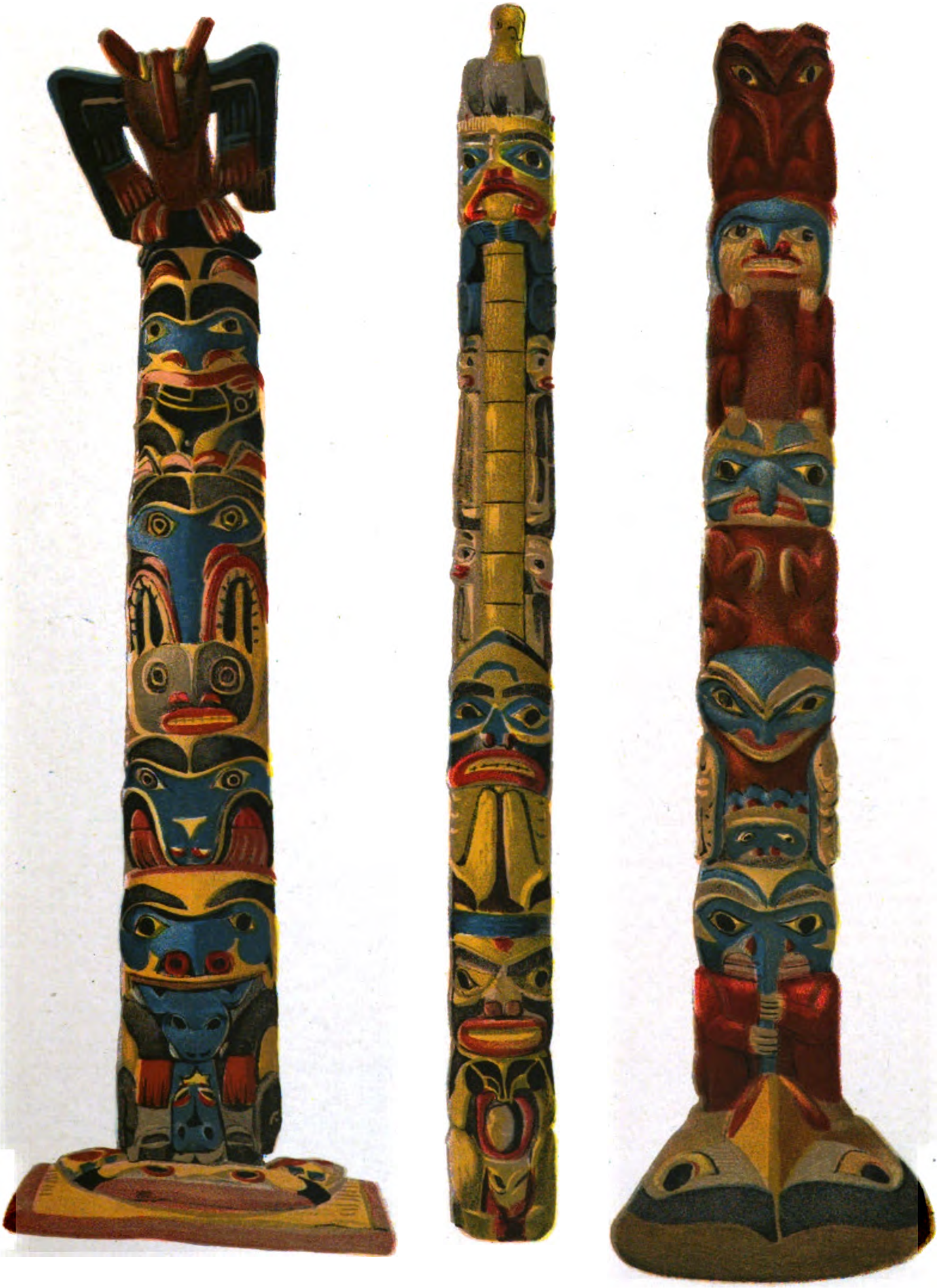
1. The totemic tribe is subdivided into a number of social units, usually clans or gentes, but sometimes families or local groups.
2. The people of the tribe possess a set of beliefs and practices, mythological, religious, ceremonial, artistic, economic, which almost in all cases centre around certain attitudes towards animals, plants, or inanimate objects.
3. These beliefs and practices are distributed among the people of the tribe in such a way that the beliefs and practices of each social unit, usually clan or gens, while not identical with those of all the other social units, are equivalent to them. The social units are thus constituted equivalent totemic units, while the entire system is a totemic complex.

Geographical Distribution of Totemic Tribes. While by no means universal in primitive society, totemism is widely distributed. In North America totemic complexes are represented, roughly speaking, in five areas: the Pacific Northwest, the Southwest, the Southeast, the Northeast, and the Eastern Plains area inhabited by tribes speaking Siouan languages and divided into totemic gentes. While our knowledge of South America is as yet very fragmentary, totemic tribes have been reported from British Guiana and Brazil. With the accumulation of further data the totemic tribes of South America may prove to be as numerous as are those of the Northern continent. In Africa a large number of totemic communities have been recorded among the negroes of the Congo, in the central eastern area, and in several districts along the western coast. Some of the exogamous gotras of India are certainly totemic. Totemism has been found in one district in Sumatra, in the southeastern section of New Guinea, in almost all of the Melanesian Islands, and in parts of Polynesia. Practically all of the known tribes of Australia have some form of totemism.

Whatever the limitations of the scope and bearing of totemism, the wide distribution of the institution indicates that the beliefs and associations involved in totemism are peculiarly congenial to early society and must be rooted in psychological attitudes widely entertained by primitive man.

Totemism as a Universal Stage in the Development of Religion. Impressed by the wide distribution of totemic phenomena and the almost universal character of the attitudes towards animals, plants, and inanimate objects which are so common in totemism, a number of authors have attempted to represent totemism as a stage in religious evolution through which all society must have passed. Most prominent among these attempts are those of Jevons, Gomme, Wundt, and Durkheim. While Gomme was satisfied to see in totemism a peculiar combination of social form and psychic disposition which to him

TOTEM POLES, SOUTHERN ALASKA



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seemed a necessary phase of religious and social development, Jevons's theory is much more ambitious. According to him totemic beliefs and rites, in addition to constituting a natural and universal outgrowth of primitive animism, also lie at the root of all animal worship, of sacrifice, of the blood covenant, of the domestication of animals. Wundt differs from Jevons in so far as he posits a stage in human development, a stage of very great duration, when totemism was unknown and the attitudes which characterize totemism remained dormant. This early period, the Era of Primitive Man, was succeeded by the Totemic Era, also of impressive duration and distinguished by a set of specific beliefs, activities, and institutions. In Durkheim's view totemism again becomes the root of all religion. He finds the birthplace of religious rites, beliefs, and concepts in the totemic institutions of central Australia. Durkheim first identifies the totemic principle, the fundamental concept underlying totemism, with *mana*, supernatural magic power, then derives it from the social setting of the individual, which in primitive Australia is constituted by the totemic clan. From the totemic principle on its conceptual side arises the belief in souls as well as the concept of deity or god, while in its dynamic aspect it becomes the forerunner of force, the scientific concept of power. The very categories of thought, such as causality, space, time, totality, find, according to Durkheim, their early prototypes in the totemic classifications of nature and its phenomena.

Theories of the Origin of Totemism. Another aspect of totemic phenomena which has received wide attention is the hypothetical origin of totemism. While differing in their specific interpretations, the different authors agree in holding that the theory of the origin of totemism which to them seems most plausible must thence have universal validity. Thus, Frazer has at different times propounded three different totemic-origin theories. The earliest one ascribes totemism to the belief in "bush souls," according to which individuals may temporarily deposit their souls in animals, plants, or inanimate objects. The second theory sees the root of totemism in the magical ceremonies of the Central Australians, which are performed by the members of each totemic clan to further the multiplication of its sacred animal. The last hypothesis, finally, known as the conceptional theory of the origin of totemism, is based on certain Australian beliefs with reference to the conception of children, according to which the visions or real experiences of pregnant women determine the totemic membership of the child. Lang claims that the first impetus towards the development of totemic ideas and practices was derived from the animal names by means of which primitive tribes so often distinguish one another. Out of the primitive speculations with reference to the origin and significance of such names totemism arose. According to Hill-Tout the totem is closely related to the personal guardian spirit, from which, in fact, it must have been derived. Haddon, finally, believes that totemism must have arisen in a state of society where local groups possessed special hunting rights and taboos with reference to different animals.

Ethnological Interpretation of Totemic Complexes. The justification of approaching totemic phenomena from the standpoints outlined above was sought in certain general and certain special postulates. The general postulates are those of the classical evolutionary conception, according to which culture in its entirety as well as in its special phases everywhere begins in essentially the same way and passes in its subsequent development through essentially similar stages. It must suffice to note here that the consensus of scientific opinion no longer supports this classical theory, serious flaws in which have been revealed by a more intensive study of fact as well as a more rigorous application of method. The special postulates underlying the totemic theories here discussed are that the particular traits of which totemism consists are always nearly the same; that these traits are organically, i.e., genetically, related; that they are specifically totemic traits; and that one is consequently justified in assuming the former existence of one or several of such traits which may be missing in any given totemic community at the time of investigation. All of these postulates may readily be shown to be erroneous. The totemic traits here referred to are totemic exogamy, the rule that no two individuals of a totemic clan may intermarry; totemic taboo, the prohibition to eat or kill the totemic animal; totemic names, clan names derived from the totemic animal or plant; totemic descent, the belief that the individuals of the clan have descended from their totemic animal; etc. Now, if one examines any two totemic areas, he will often discover that the above traits are by no means equally represented in the two areas. The comparison, e.g., of the totemism of some of the tribes of the American Northwest with that of some of the Central Australian tribes, reveals the fact that, while totemic names are found in both places, they do not apply to the corresponding social units; that exogamy, while represented in both areas, does not appear as a primary feature of the totemic clan, but as a derivative feature, due to the fact that the clan is comprised in a larger social unit, the phratry; that totemic taboo and descent, while represented in the Australian area, are altogether absent in the American one; and, what is still more significant, one finds that in addition to the classical totemic traits certain other traits appear in both areas: in America association of the totem with the guardian spirit, a feature not found in Australia, and a highly developed art deeply saturated with totemic ideas, whereas the totemic art of Australia is at best a passive reflection of the totemic content; in Australia magic ceremonies for the multiplication of the totemic animal, while in America similar ceremonies appear altogether apart from totemism; and a belief in the incarnation of ancestral totemic spirits, while in America the belief in incarnation exists, but again does not refer to totemic spirits. A further comparison of the results reached with the conditions in other totemic areas, in America, Africa, Melanesia, confirms the impression that, while several of the totemic traits here enumerated have a wide distribution, the various totemic groups or complexes differ often strikingly in the nature, number, and cultural significance of their totemic traits. The more extended comparison also reveals the fact that the traits so far considered in association with totemism are by no means restricted in their distribution to totemic complexes, but occur also where there is no totemism. Thus, animal names and taboos must be recognized as features of much wider distribution than totemism, and the same is true of the belief in animal descent; exogamy not infrequently is associated with groups that are not totemic, such as villages, or groups of individuals related by blood; and so on with the other traits. Thus, the conclusion is reached that totemic complexes are not genetically simple, but must be regarded as highly complex aggregates of features of disparate historic derivation, which, being brought together by a process of secondary association, are welded into a more or less perfectly integrated totemic system. The acceptance of the above view of totemic phenomena inevitably leads one to assume a critical attitude towards the conception of totemism as derived from one particular source, or as the most primitive form of religion, or as a universal stage in the development of religion. Being correlated with a definite form of social organization, usually a clan system, totemism may not be ascribed to tribes that are not organized on such a basis. Tribes whose social organization is of the family-village type are very numerous, nor is there any evidence that such tribes have ever passed through a clan stage; hence they never had totemism. Moreover, some tribes with clan systems have no totemism, and, in the absence of convincing evidence to the contrary, one is not justified in attributing totemism to them in the past, there being no necessary genetic connection between totemism and clan systems. Totemism not being universal, religion, which is universal, can obviously not be derived from it. Totemism, moreover, cannot be strictly conceived as a primitive institution, for it must have been unknown during that entire period designated by Wundt as the Era of Primitive Man, when the local group and the loosely articulated family constituted the framework of social organization. When totemism is considered on its religious side, one must always remember that, if that term is at all applicable to totemism, it is an altogether peculiar variety of religion, in so far as an essential aspect of totemism is constituted by its social connotations. Totemism is not a religion of the tribe but of the clan, which means that the specific content of that religion differs with each clan, the unity of the tribal complex being conditioned by the formal identity of these clan religions. Therefore, the Kangaroo clansmen of central Australia, e.g., whose particular beliefs and rites are altogether different from those of the Dingo clansmen, will nevertheless have no quarrel with the latter, although individuals of the two clans will often be represented in the same local group, in fact, in one family; therefore, also, the Kangaroo men, who may not kill nor eat the kangaroo, will remain undisturbed if the killing and eating are done by a Dingo man. It has also been observed that the totemic religion scarcely ever constitutes the whole of the religion of a people, but is accompanied by ancestor worship, or fetichism, or any other form of belief. As to the origin of totemism, it needs hardly be said that all monogenetic attempts in that direction must be summarily rejected, for an institution so complex in its composition can obviously not be assumed to have always found its beginning in one source.

Totemic Complexes and Religious Societies. Totemic communities, as complexes of historically and psychologically heterogeneous features, display certain striking similarities to another form of socio-religious association fairly common in primitive groups, viz., religious societies. A religious society is a group of individuals who bear a common name (often derived from an animal), share a set of religious and mythological beliefs, and perform together certain ceremonies. Where the societies occur, there is always more than one such society in the tribe, while often a large part of the individuals of the tribe are grouped in religious societies. While male societies are by far the more common, female societies also occur, but almost invariably the membership of a society does not include both sexes, but is restricted to the one or the other. The geographical distribution of religious societies is rather striking. In a large number of totemic areas religious societies also occur, e.g., in the Northwestern, Southwestern, Southeastern, and Eastern Plains areas of North America, in west Africa, and Melanesia. This distribution suggests possibilities of genetic relationship. Webster has propounded a theory according to which religious societies are to be regarded as totemism in decay, as a normal stage of evolution from totemism to other forms of religious organization. In this dogmatic form the theory must certainly be rejected, but it may contain a germ of truth in so far as genetic relationship between totemism and religious societies may have obtained in individual instances. Thus, in the southwest of North America religious societies may have developed out of totemic clans, while in the Eastern Plains area, represented by the Omaha and other Siouan tribes, totemic gentes may have grown out of local groups with religio-ceremonial functions. According to recent evidence such relations between the two institutions also seem probable in certain parts of Melanesia. Of even greater interest than the geographical and the possible genetic relations between totemism and religious societies, are the similarities and contrasts of the two institutions from the theoretical standpoint. In the one case as in the other the tribe is divided into a set of social units; these units have common functions, ceremonial, religious, artistic; and these functions cluster about or grow out of certain attitudes towards animals, plants, or inanimate objects, although the latter feature is by no means so characteristic of religious societies as it is of totemic complexes. In the one case, moreover, as in the other the institution must be regarded as a complex of historically disparate traits. The similarity thus seems almost to approach identity. The contrasts, however, are equally significant. While religious societies, like clans, are social units, they are constituted social units solely by the exercise of common functions. Take away the functions and nothing remains but an aggregate of wholly unrelated individuals. Not so in the case of the clan. While it is true that with the clan also the functions determine its precise position in the culture of the group, the clan would remain a social unit even if stripped of all its functions. This is due to its social composition, for a clan is a hereditary group of individuals who are in part related by blood and in part assume themselves to be so related. This constitutes perhaps the most fundamental contrast between a clan and a religious society. Other differences are not lacking, however. The religious aspect is almost invariably more pronounced in the societies than it ever is in totemic clans. The societies are largely unisexual, while the clan always embraces related individuals of both sexes. The clan is a hereditary unit, while the society is usually nonhereditary, although certain offices in it may be hereditary, and a tendency towards inheritance of the society itself occurs here and there. Thus, what might be called the sociopsychological flavor of a tribal group of religious societies is quite distinct from that of a totemic complex. Therefore, while the two institutions present from the theoretical standpoint a set of similar problems, it will be profitable to keep them apart conceptually as well as for purposes of intensive study.

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TOTE'RO. See TUTELO.

TÓTH, tŏt, KOLOMAN (1831–81). An Hungarian poet, born at Baja, County of Bács-Bodrog. He took part in the revolution of 1848 and published in 1852 his first collection of patriotic poems, which achieved instant success. The next year appeared *Paul Kinizsi*, composed in imitation of the *Toldi* of Arany (q.v.). Then came a number of plays, one of which, *Egy királyné* (A Queen, 1857), took the Hungarian Academy's prize. In 1860 Tóth founded the comic paper *Bolond Miska* (Foolish Michael). The same year he was elected to the Kisfaludy Society and in 1861 to the academy. The play *A nök az alkotmányban* (Women in Constitutional Life, 1871) was the first to be well received on the stage, Tóth's popularity being in the field of patriotic verse.

TOT'ILA (?–552). An Ostrogothic king whose real name was Baduila. He was chosen in 541 to occupy the throne made vacant by the assassination of his uncle Hildibald. He prosecuted the war against the forces of the Eastern Emperor not only with great success but also with generosity and humanity. After reducing southern Italy he laid siege to Rome, to relieve which Justinian had sent out the celebrated Belisarius. The city fell, however, in 546, and after two more years of warfare, in which he was poorly supported, Belisarius asked to be recalled. Totila thereupon ravaged Sicily, reduced Sardinia and Corsica, and harassed the coasts of Greece, but in 552 was defeated and killed at Taginæ by an army under the eunuch Narses. Consult Edward Gibbon, *Decline and Fall of the Roman Empire* (ed. by J. B. Bury, vol. iv, London, 1912), and *Cambridge Medieval History*, vol. ii (New York, 1913).

TOTLEBEN, tŏt'lā-ben, or **TODLEBEN,** FRANZ EDUARD IVANOVITCH, COUNT (1818–84). A Russian general of engineers. He was born at Mitau, Courland, May 20, 1818, and after studying at Riga was admitted as a student to the college of engineers at St. Petersburg. He served as a lieutenant of engineers in the Caucasus campaign of 1848–51 and in 1854 took part in the siege of Silistria. When the French and English troops undertook the siege of Sebastopol, Totleben, then a colonel, was sent to assist in its defense. The fortifications were placed under his direction. The principle on which he acted was to watch the works of the allies and to establish against them on every point a superiority of fire, by multiplying the number and increasing the calibre of his guns. The prodigious activity displayed by the Russians in making good the damage sustained by the heavy fire of the enemy filled the allied army with astonishment. Massive ramparts mounted with formidable batteries rose at each threatened point within the line of defense. In June, 1855, Totleben was wounded, and he was forced to relinquish active supervision of the defense. After the conclusion of peace, he expanded what was at first a mere engineer's report into a history of the war in the Crimea, entitled *Défense de Sebastopol*. For his services Totleben was made adjutant to the Emperor and in 1869 general of engineers. In the Russo-Turkish War of 1877–78 Totleben was intrusted with the investment of Plevna after repeated assaults on the works had been repulsed with immense slaughter. He succeeded in completely cutting off the city from all outside relief, so that finally nothing was left to Osman Pasha but to attempt to break through the lines of the besiegers, in which he failed. In April, 1878, he received the supreme command of the Russian forces in Turkey. He became Governor-General of Odessa in 1879 and commandant of Vilna in the following year. He died at Soden, Germany, July 1, 1884, and was buried in Sebastopol. (See CRIMEAN WAR.) There are biographies of Totleben by Brialmont (Brussels, 1884) and by Krähmer (Berlin, 1888).

TOTNES, tŏt'nĕs, GEORGE CAREW, EARL OF. See CAREW.

TOTO'NAC. An ancient cultured nation whose territory embraced the northern portion of the present State of Vera Cruz, with the adjacent portion of Puebla, Mexico. Their language has numerous Mayan and Nahuatlan affinities, but appears to be of distinct stock. They claim to have come from the northwest about 800 years before the Spanish Conquest and to have been the builders of the remarkable ruins of Teotihuacan, about 10 miles northwest of the city of Mexico. For several centuries they had maintained their independence, but had been conquered by the Aztec emperors some time before the coming of the Spaniards. Cortés made his first landing in their territory. They were fully as advanced as the Aztecs. Their capital, Cempoalla, was about 5 miles from the seacoast, with houses built of brick and mortar, each house in the centre of a small garden watered by a constantly flowing stream, and the city itself was surrounded by fruit trees and fields of grain. Their religion was a ceremonial sun worship, and they practiced circumcision and head flattening. They still constitute an important part of the population of their former territory, retaining many of their ancient rites interwoven with those of the conquering religion.

The superbly carved stones of peculiar shapes that are commonly ascribed to the Totonac have an excellence second only to Maya sculpture. The most interesting stones are shaped like a capital U and are called sacrificial yokes, although their original use is unknown. Human and reptile motives are combined in the elaboration of these yokes. Other stones of peculiar shapes bear remarkable sculptures of birds, etc. In pottery the most beautiful objects are the so-called "laughing faces," which are infectious in their realism. All of these faces wear broad smiles. It is in the Totonac area that the art of the Archaic Mexican type seems to have first come under the influence of the Maya. The most famous ruin is that of Papantla.

TOTONICAPAN, tŏ′tô-nē-kȧ-păn′. A town in the department of the same name, Guatemala, 61 miles northwest of the capital city (Map: Central America, B 3). Its population is almost wholly native, of Quiché descent, and its industries accordingly consist of simple weaving and wood and stone work. The town was the centre of the Quiché opposition to Alvarado. Pop. (est.), 18,000.

TOT′TEL, RICHARD (c.1525–94). An English publisher, compiler of the celebrated *Tottel's Miscellany*. Of his early life nothing is known. Granted in 1553 a seven years' patent to print law books, and charter member of the Stationers' Company in 1557, his patent was renewed for life in 1559. He reached a high position in the Stationers' Company, but left it in 1589 on account of ill health. Besides the law books issued, Tottel published volumes of general literature which invest him with a bibliographic interest. Among these were More's *Dialogue of Comfort* (1553); Lydgate's *Fall of Princes* (1554); Hawes's *Pastime of Pleasure* (1555); Grimald's translation of *De Officiis* (1556); and Surrey's translation (1557) of the second and fourth books of the *Æneid*—the earliest English blank verse known. The *Miscellany* appeared June 5, 1557, and contained 271 unpublished poems by Surrey, Wyatt, Grimald, Forrest, Heywood, Thomas, Vaux, and others unidentified. The verse of Surrey and Wyatt is not known to have appeared elsewhere. The *Miscellany* was the first of poetic anthologies in England.

TOT′TEN, JOSEPH GILBERT (1788–1864). An American soldier, born at New Haven, Conn. He graduated at West Point in 1805 and during the War of 1812 served as chief engineer in the campaign of 1812–13 on the Niagara frontier and in that of 1813–14 on the Lake Champlain line of operations, and participated in the battle of Queenstown Heights, the capture of Fort George, the attack on La Cole Mill, and the battle of Plattsburg. For gallant conduct in the last-named engagement he was brevetted lieutenant colonel. In 1847, during the Mexican War, he directed the engineering operations in the siege of Vera Cruz and for his services was brevetted brigadier general. During the Civil War he served as commander of the corps of engineers (1861–64), as president of a board to regulate and fix the ordnance of permanent fortifications and field batteries (1861–62), and on April 21, 1864, one day before his death, was brevetted major general, U. S. A. He was much interested in the natural sciences and was an authority on conchology. Two species of shells, the *Gemma Tottenii* and the *Succinea Tottenii*, were named in his honor. He published *Reports on National Defenses* (1851), *Essays on Ordnance* (1857), and other works.

TOTTENHAM, tŏt′*en-am*. A town in Middlesex, England, a connecting suburb of London, 6 miles northeast of St. Paul's (Map: London, C 8), on the river Lea. The town is mainly residential, and among its public parks is the Bruce Castle Park, the site of the old Bruce estate and castle in which King Robert's father died in 1303. Alexandra Palace, a favorite metropolitan pleasure resort, is partly within the urban limits. Pop., 1901, 102,703; 1911, 137,418.

TOTTORI, tôt-tō′rē. The capital of the Prefecture of Tottori, in west Hondo, Japan, 70 miles northwest of Kobé (Map: Japan, D 6). It has manufactures of cotton and silk goods. Pop., 1908, 32,682.

TOUCAN, to͞o-kăn′ *or* to͞o′kăn (Brazil. *toucano*, probably "nose bone," less plausibly explained as meaning "feather," or of onomatopoetic origin). A bird of the family Rhamphastidæ, related to the barbets, jacamars, and puff birds (qq.v.), and not very distantly to the woodpeckers, and containing about 60 known species, all natives of tropical America and remarkable for the magnitude of the bill. They are divided into two groups, the true toucans (*Rhamphastos*) and the araçaris (*Pteroglossus*), of which the latter contains the greater number of species; the former has the larger bill, and the tail is shorter. There is a difference also in the prevalent colors, the araçaris generally exhibiting much green and yellow, while the true toucans have the ground color of the plumage usually black; the throat, breast, and rump often gayly adorned with white, yellow, and red. The colors, however, are not in general finely blended, but appear in strong contrast. The legs of toucans are short; the feet have two toes before and two behind. The form of the body is short and thick; the tail is comparatively short, rounded or even, and is turned up over the body when the bird is at roost. The base of the enormous bill is of the full width and depth of the head; it is in some species more than half the length of the body. The bill is arched towards the tip, irregularly toothed along the margins of the mandibles, and extremely cellular and light, yet strong in structure. The tongue is long, narrow, and singularly feathered on each side and takes an important part in gathering food. Toucans eat fruits with avidity, but they also seize and devour small birds, lizards, etc. They make a curious clattering noise with their great mandibles and emit a harsh cry. They live chiefly in the depths of the South American forests, in small flocks. Almost nothing is known of their life histories, but they are supposed to lay white glossy eggs in hollows of trees, making little if any nest for them. Toucans are easily tamed and in captivity readily eat rice, bread, potatoes, eggs, meat, and other kinds of food and make amusing pets. The colors of the bill are in most species brilliant during life, but disappear from stuffed specimens. The largest species, as the toco of Argentina (*Rhamphastos toco*), are about 24 inches in length, the bill in this species measuring 7½ inches and the tail 10 inches. One of the most familiar species is the Brazil ariel, in which the throat is yellow and the rump scarlet. See Plate of HORNBILLS AND TOUCANS.

TOUCEY, tou'sĭ, ISAAC (1796–1869). An American statesman, born at Newtown, Conn. He was educated privately, studied law, and was admitted to the bar at Hartford in 1818. From 1822 to 1825 he was State's attorney for Hartford County and from 1835 to 1839 was a member of the United States House of Representatives. He was again State's attorney in 1842–44 and was elected Governor by the Legislature in 1846, when the election, instead of being decided by the people, was put upon that body. From June, 1848, to March 3, 1849, he was Attorney-General of the United States. In 1850 he served in the State Senate and in 1852 in the State House of Representatives. In 1852–57 he was United States Senator and under President Buchanan he was Secretary of the Navy (1857 to March 3, 1861). It was charged by the Republicans that he had manifested sympathy with the Southern cause by sending the warships of the United States to distant stations so that they could not readily be joined for action.

TOUCH (OF. *toucher*, *tocher*, Fr. *toucher*, It. *toccare*, from Ger. **tukkōn*, OHG. *zuckan*, Ger. *zücken*, to twitch). One of the five special senses; the tactile sense. The sense of touch is widely distributed, but it must be distinguished from the other varieties of common sensation—pain, and temperature perception. These are perceived through the same nerves—the sensory—but the nerve fibres which are identified with the sense of touch proper are provided with special end organs, and the sense, moreover, is exercised in any degree of perfection only in those parts where there is an abundance of special end organs. These are of two kinds: touch corpuscles, situated chiefly in the skin; and end bulbs, found mainly in the mucous membranes. The lips and genital organs, being on the border line of skin and mucous membrane, are possessed of both touch corpuscles and end bulbs. The Pacinian corpuscles are widely distributed, but their part in connection with the tactile sense is only partially understood. They are numerous as the nerves of the palmar surface of the fingers, but, when found, are situated deeply in the skin or in the subcutaneous tissue. The acuteness of the sense of touch depends to some extent on the cutaneous circulation, and this is largely influenced by the surrounding temperature. The numbness produced by the application of cold to the surface of the body is thus explained.

The acuteness of the sense of touch is commonly measured by an instrument known as the æsthesiometer and consisting of two needle points in arms movable upon a graduated scale. A pair of compasses may be used in the same way. The nearer together the points can be separately perceived, the greater the delicacy of touch. The distance at which these two points can be separately distinguished in various parts of the body is indicated in the following table:

	Millimeter
Tip of tongue	1.1
Palm of terminal joint of finger	2.2
Palm of second joint of finger	4.4
Tip of nose	6.6
White part of lips	8.8
Back of second joint of finger	11.1
Skin over cheek bone	15.4
Back of hand	29.8
Forearm	39.6
Sternum	44.0
Back	66.0

It will thus be seen that the point of greatest delicacy of touch is the tip of the tongue, and the seat of the least developed tactile sense is the skin over the spinal column. The sense of touch, like all other perceptions, can be sharpened by use. This improvement is not to be explained by an increased development of the terminal organs, nor by a growth of new nerve fibres in the skin, but by a more exact limitation of the sensation areas in the brain. Many artisans acquire a highly specialized sense of touch. The delicacy of the tactile sense in the blind is well known; they are able to read fine raised letters and to make articles of delicate structure in a manner impossible to individuals who can see. See CUTANEOUS SENSATIONS; PSYCHOLOGICAL APPARATUS; PSYCHOLOGY; SENSATION; SKIN.

TOUCH. In music, a term denoting the manner in which the digitals of a keyed instrument are manipulated. Most important are the smooth legato touch and the detached staccato touch. It is of vital importance which muscles are employed in playing different passages. The muscles of the fingers, the wrist, and the arm produce very different effects, generally distinguished as tone color. Thus, when we speak of a pianist as lacking in color, it means that he employs one set of muscles almost to the exclusion of others. It is the matter of touch that produces what are called singing, velvety, or hard tones.

TOUCH IN ANIMALS. A general term for the cutaneous senses of pressure, pain, and temperature, as evidenced by the selective reactions of animals to contact, warmth, and cold.

Mammals behave as if sensitive to contact, and it is probable that the hairs which are found upon the skin of all mammals are organs of pressure. (See CUTANEOUS SENSATIONS.) The vibrissæ of rats have been shown to be highly developed forms of such pressure organs. Most mammals, moreover, appear to possess a sense of support; thus, they will not, when blinded, walk off the edge of a table. The ability of bats to avoid small wires stretched in the path of their flight depends to a great extent upon the excitability of the ears, as is shown by the result of stopping the auditory meatus. It has been suggested that the drumskin of the ear acts in this case as an organ of touch, excited by the condensations of the air which occur when the bat approaches a wire. Fish and amphibia show many responses to contact. Some fish are unequally sensitive to pressure in different regions; and some, it is thought, swim against the current of a stream in response to pressure cues from the flowing water. See KINÆSTHETIC SENSATIONS IN ANIMALS; MECHANICAL SENSE IN ANIMALS.

In general, mammals are sensitive to thermal stimuli. Rats and squirrels have been trained to discriminate between two temperatures separated by as little as 10° C. A study of the dependence upon temperature of the breathing rhythm of the decerebrized frog makes it appear that the frog, at least in a reflex manner, is as sensitive as the human being to thermal changes. For touch in man, see CUTANEOUS SENSATIONS. Consult J. B. Watson, *Behavior* (New York, 1914).

TOUCH PAPER. See PYROTECHNY.

TOUCHSTONE, or LYDIAN STONE. A hard black variety of quartz or flinty jasper used for testing the purity of precious metals, especially gold. The stone originally used was a peculiar bituminous quartz from Lydia in Asia Minor. When a piece of gold is rubbed across the surface of the stone, it leaves a streak which is more or less reddish, according to the amount of copper that it contains, and by comparing the streak with those of alloys of known composition the expert can determine approximately the value of the metal. See BASANITE.

TOUCH'WOOD. The decayed wood of willows and some other trees used as tinder. See AMADOU.

TOUL, to͞ol (anciently *Tullum Leucorum*). A fortified town, capital of an arrondissement in the Department of Meurthe-et-Moselle, France, 14 miles west of Nancy (Map: France, N., L 4). The former cathedral of St. Etienne is noted for its graceful proportions, octagonal towers, and thirteenth-century cloisters; the fine Gothic church of Saint-Gengoult also has elegant cloisters, in the flamboyant style of the sixteenth century, and the eighteenth-century episcopal palace is now used as the town hall. The bishopric, founded in the fifth century, was suppressed at the time of Napoleon. In the latter part of the Middle Ages and later down to 1552 Toul was a free city of the German Empire. In that year it was seized by Henry II of France. In 1790 its fortifications were reconstructed upon the Vaubanian principle. In 1814 the town was stormed by the Russians, and on Sept. 23, 1870, it was taken by the Germans after a siege of nearly six weeks. Pop., 1901, 12,287; 1911, 13,663.

TOULINGUET, to͞o'lăɴ'gā'. See TWILLINGATE.

TOULMIN, to͞ol'mĭn, HENRY (1767–1823). An American jurist, born at Taunton, England. He removed in 1793 to Virginia and from 1794 to 1796 was president of Transylvania University. In 1796–1804 he was Secretary of State of Kentucky and in the latter year was appointed judge of the United States Circuit Court of Mississippi. Subsequently he served in the Alabama Legislature and assisted in framing the constitution of that State. He published: *A Description of Kentucky* (1792); *Collection of the Acts of Kentucky* (1802); *Review of the Criminal Law of Kentucky* (1804), with James Blair; *Digest of the Territorial Laws of Alabama* (1823).

TOULMIN, JOSHUA (1740–1815). An English Unitarian clergyman. He was born in London and became pastor of a dissenting congregation in Colyton, Devonshire, in 1761. In 1765 he accepted a call from a Baptist congregation in Taunton. He then turned Unitarian and in 1804 became minister of a Unitarian congregation at Birmingham. He published many biographies, including *Memoirs of Faustus Socinus* (1777), also *A Historical View of the State of the Protestant Dissenters in England under King William* (1814), and edited Neal's *History of the Puritans* (new ed., 5 vols., 1822). A volume of sermons was published after his death (1825).

TOULON, to͞o'lōɴ'. The capital of an arrondissement in the French Department of Var, a fortress of the first class, and the second naval station in France (Map: France, S., L 5). It is situated on a fine and well-protected bay of the Mediterranean, 42 miles east-southeast of Marseilles, and is partly surrounded by hills, crowned by detached forts. The old town in the southern part of the city is of uninviting appearance. Surrounding it on the north are the modern quarters embellished with wide avenues and fine buildings. In the old town is situated the only ancient building of any particular architectural value—the Sainte-Marie Majeure Church. It is Romanesque and dates from the eleventh century; it contains a handsome reredos. Besides the numerous naval and military open spaces and grounds (including the Place d'Armes) in Toulon, there are in the northern part two spacious and prominent squares—the Place de la Liberté (the finest in the new town) and the Jardin de la Ville, an attractive promenade. The most important avenue of the city, the Boulevard Strasbourg, connects the two squares, and on it are the Musée Bibliothèque (a handsome modern Renaissance edifice) and the immense Marine Hospital. The Place d'Armes, to the southeast and near the port, is the main square in the city.

The harbor has five principal basins. It connects with surrounding bays, which stretch away under hills bristling with forts, and extends past Fort de l'Aiguillette out into the great harbor or roadstead which opens into the sea. The port has an easy access and is well sheltered. The marine arsenal, an immense and complete establishment with its buildings, basins, and canals, adjoins the city on the west. It dates from the time of Henry IV and on an enlarged scale was planned by Vauban. It embraces 650 acres.

Toulon has a lyceum, the Ecole Rouvière, marine schools, a marine library, a marine botanic garden, and a marine observatory. Shipbuilding, iron and copper founding, lace making, fishing, and viticulture are the main industries. The vicinity produces olives and figs. The principal exports are wines, oils, and fruits. In 1912 there entered and cleared 1043 vessels of 587,948 tons. Pop., 1901, 101,602; 1911, 104,582.

Toulon is the ancient Telo Martius, noted for its dye works. It was destroyed by the Saracens in 889, and like calamities befell it in the twelfth century. It surrendered to the forces of Charles V in 1524 and also in 1536. Henry IV and Louis XIV fortified it. It repelled the allied fleets of England and Holland in 1707. In 1793 it was turned over by the Royalists to the English and their allies. It was thereupon besieged by the forces of the Convention, Napoleon Bonaparte gaining there great distinction as commander of the artillery. The town was taken in December, and its inhabitants were ruthlessly punished. Consult: Octave Teissier, *Notice sur les archives communales de la ville de Toulon*

(Toulon, 1863); G. Lambert, *Histoire de Toulon* (3 vols., ib., 1886–89); Rozet, *Essai sur la climatologie de Toulon* (Paris, 1890).

TOULOUSE, tōō′lōōz′. A city of France, formerly the capital of Languedoc and the present capital of the Department of Haute-Garonne. It is situated 130 miles southeast of Bordeaux (Map: France, S., F 5). Toulouse lies in a rich valley on the right bank of the navigable Garonne. It is subject to high winds, to floods, and in summer to very hot weather. Three bridges across the river connect the city with the Faubourg Saint-Cyprien on the west bank. The noble Pont Neuf, a stone bridge of seven arches, dates from 1543. The streets of Toulouse are for the most part narrow, unattractive, and poorly paved. Two wide lines of boulevards, however—the outer one following the canals—divide the city from the surrounding suburbs, and many extensive improvements have been begun. On the extreme east is the Parc du Caousou.

In the centre of the town, in the Place du Capitole, stands the Capitole, or town hall. It dates from the sixteenth century, but has recently been almost wholly reconstructed. It possesses little architectural merit. The edifice owes its name to the city magistrates, or Capitouls, who ceased to exercise their functions about the time of the French Revolution. It is the seat of the famous Académie des Jeux-Floraux, an ancient literary institution which lends especial renown to the city. These Jeux-Floraux, or Floral Games, which date from 1324, are poetical tournaments, in which the prizes allotted on May 3 of each year consist of flowers of gold and silver. In the Capitole also are an academy of legislation, founded in 1851, and an academy of science, inscriptions, and belles-lettres, founded in 1640.

Near the Capitole are the Municipal Theatre and a square donjon, restored by Viollet-le-Duc. The latter contains the city's archives. Farther south is the museum of fine arts, occupying in part an ancient Augustine convent. In this section of the city is the cathedral of Saint-Etienne, a curious inharmonious edifice belonging to different times and architectural types.

In the extreme southern part of the city are the Jardin des Plantes and the Jardin Royal. Here splendid, spacious avenues unite in the sightly Grand Rond, which is decorated with statues. To the west is the Palace of Justice, formerly the Palace of the Parlement, with several beautiful rooms. In the vicinity stands the statue of the jurist Jacques de Cujas, a native of Toulouse. Northward is the church of Notre Dame de la Dalbade, whose square tower, splendid Renaissance portal, and interior merit mention. Prominent among the old mansions in the vicinity is the Hôtel Lasbordes—a splendid creation of Bachelier, much of whose work is to be seen in Toulouse. Farther north, near the Pont Neuf, is the church of Notre Dame de la Daurade. Not far away is the lycée, occupying part of the extensive Renaissance establishment of the merchant Bernuy, who guaranteed the ransom of Francis I after the French defeat at Pavia. In the vicinity is the Protestant church. To the north of the Capitole and connected with it by the Rue du Faur, the most important street in the city, is Saint-Sernin, the finest church in Toulouse. It is a superb cruciform Romanesque structure, begun in the eleventh century and restored under Viollet-le-Duc. The splendid octagonal tower rises 210 feet, with tiers of triangular arches. Saint-Saturnin, the martyred apostle of Toulouse, is buried here.

At the head of the educational institutions stands the university. (See TOULOUSE, UNIVERSITY OF.) There are a splendid school of medicine, a school of fine arts, a veterinary college, an observatory, an artillery school, a museum of industrial art and antiquities, and, in addition, many learned societies which occupy now the splendid Hôtel d'Assézat, bequeathed to them in 1896. The city library has over 213,000 volumes and 1000 manuscripts.

Toulouse is a city of wealth and prominence industrially and commercially, owing to its commanding position in the south of France. The Canal du Midi (q.v.) is here joined by the Canal Latéral, and thus commerce between the Atlantic and the Mediterranean is accommodated by water, Toulouse being the centre of this traffic. Much of the commerce from interior France to Spain also passes through Toulouse. The trade of the city is very extensive in wine and grain. There are two historic mills on the river. One is known to have existed in 1182; the other traces its origin back to the ninth century. There are a national tobacco factory, iron and copper foundries, a cannon foundry, and carriage and farm-machinery works. Stained glass is also manufactured. Pop. (commune), 1901, 149,841; 1911, 149,576.

History. Toulouse, the ancient Tolosa, was long prominent before the Romans came into Gaul. It was taken by the consul Cæpio in 106 B.C., and he despoiled its great shrine of the rich treasures for which it had been famous. It became the chief city of the Visigoths in 419, and it fell into the hands of the Franks in 507. It was long important as the seat of the counts of Toulouse. In the early part of the thirteenth century it suffered terribly in the Albigensian troubles. In 1562, 4000 Huguenots were killed in Toulouse. The Protestant Jean Calas, made famous by the noble exertions of Voltaire, was broken on a wheel here in 1762 on an unjust charge. At Toulouse Soult made an unsuccessful stand against Wellington on April 10, 1814. Consult: A. L. C. A. Du Mège, *Histoire des institutions religieuses, politiques . . . de Toulouse* (4 vols., Toulouse, 1844–46); Justin Jourdan, *Panorama historique de Toulouse* (ib., 1877); *Toulouse: histoire, archéologie monumentale, facultés, etc.* (ib., 1887), published anonymously; C. Douais, *L'Art à Toulouse: matériaux pour servir à son histoire de XVme au XVIIIme siècle* (Paris, 1904).

TOULOUSE, COUNTY OF. A feudatory state, which played a prominent rôle among the principalities of mediæval France. It was established by Charles the Great in 778, and its rulers became hereditary about the middle of the ninth century. The dominion of the counts finally extended over the whole of Languedoc, over Rouergue, and over part of Guienne and Provence. Count Raymond IV had a distinguished share in the First Crusade (1096–99). He died in 1105. His son Bertrand established the Principality of Tripolis on the coast of Syria. Raymond VI (1194–1222) is celebrated as a patron of the Provençal poets and in connection with the Albigensian wars. Having refused to take severe measure against the Albigenses, he incurred the wrath of the Church, which let loose against him the crusading forces of Simon de Montfort, to whom Raymond's possessions were transferred by Pope Innocent III. Raymond was unable to make head against the invaders, who overran and laid waste his country. Simon de Montfort fell at the siege of Toulouse in 1218, and not long after Raymond succeeded in recovering a part of his lands. He enjoyed his regained power, however, for only a brief time, dying in 1222. His son Raymond VII (1222–49) secured possession of most of the dominions of his house, but in 1229 he was forced to cede a large part to Louis IX of France and acknowledge him as his overlord. His daughter and heiress, Jeanne, was married to the King's brother, Alphonse, Count of Poitou, on whose death, in 1271, the County of Toulouse was united with the French crown.

TOULOUSE, Edouard (1865–). A French alienist and psychologist, born at Marseilles. He studied medicine in his native city and at Paris, and was physician of the insane asylums of the Seine and then head physician of the asylum at Villejuif. At the latter place he established a laboratory of experimental psychology and with N. Vaschide invented much of the apparatus there used. He was founder and editor of the *Bibliothèque de Psychologie Expérimentale* and of the *Revue de Psychiatrie* and an editor of *La Revue Scientifique.* His writings include: *Les causes de la folie* (1896); *Emile Zola* (1896); *Organisation scientifique d'un service d'aliénés* (1900); *Les conflits intersexuels et sociaux* (1904); *Technique de psychologie expérimentale* (2 vols., 1905; 2d ed., 1911), with N. Vaschide and H. Pieron; *Les leçons de la vie* (1906); *Henri Poincaré* (1910); *Comment former un esprit* (1910); *Comment conserver sa santé* (1914).

TOULOUSE, University of. A French university, founded as a result of the Albigensian heresy and the crusade against Toulouse, as a bulwark of orthodoxy, by Pope Gregory IX in 1230–33. It is the first of European universities founded by deliberate purpose and thus became the model for later foundations. Its chief purpose was originally theological, but it developed into a noted school of law and eventually took up the royal as against papal interests. It was particularly rich in colleges, no fewer than 10 well-endowed foundations being enumerated. At the Napoleonic reorganization it was, like other universities, merged into the national system. It includes now four regular faculties: law, medicine and pharmacy, science, and philosophy, besides the faculty of Protestant theology of Montauban, and the two "free faculties of theology and philosophy." In 1913 it had nearly 2869 students. The university library contains over 139,423 volumes, besides 30,500 volumes at Montauban.

TOUMEY, James William (1865–). An American forester, born at Lawrence, Mich. He graduated in 1889 from the Michigan Agricultural College and later studied at Harvard. He served as professor of biology at the University of Arizona in 1891–98 and as director of the Arizona Agricultural Experiment Station in 1897–98. For two years he was connected with the government forestry service; he then went to Yale, rising to be director of the Forest School (1910). His writings include articles and bulletins on agriculture, botany, and forestry.

TOUR, tōōr, Maurice Quentin de la. See La Tour, Maurice Quentin de.

TOURACOO, or Touraco. Same as Turaco (q.v.).

TOURAINE, tōō-rân′. One of the former provinces of France, corresponding to the present Department of Indre-et-Loire. The capital was Tours (q.v.). After having been under the rule of its own counts Touraine was united about the middle of the eleventh century with Anjou. With Anjou it passed in 1154 to England. It was reacquired by France half a century later, was made a duchy in 1356, and was definitively united with the crown in 1584. See "Map of France, Showing Former Provinces," under France.

TOURANE, tōō-rân′, or Touran. A town of Annam, 40 miles southeast of Hué (q.v.) (Map: French Indo-China, E 3). There are large substantial markets, a silk filature, an opium farm, etc. Numerous steamers maintain communication with Europe and the adjacent ports, and there is an extensive commerce carried on in sugar, rattan, bamboo, areca nuts, silk, and cassia. Tea, coffee, and the mulberry are cultivated in the neighborhood, and coal is mined. Pop., 1913, 7853, of whom 184 were Europeans.

TOURAS′SIAN EPOCH. The name sometimes applied to an epoch of European prehistoric archæology at the end of the Paleolithic period, just before the close of the Quaternary. It is so named from the rock shelter of Tourasse at Saint-Martory, Haute-Garonne, France. See Paleolithic Period.

TOURCOING, tōōr′kwăɴ′. The capital of an arrondissement in the Department of Nord, France, 7½ miles northeast of Lille (Map: France, N., J 2). It is practically a part of the great industrial centre Roubaix. The town has a fine modern Gothic church, a large new town hall, a chamber of arts and manufactures, and schools of painting, drawing, music, and architecture. In 1866 a monument was erected to commemorate the defeat here in 1794 of the English and Austrians by Jourdan and Moreau. The wool-manufacturing output of this district represents nearly the entire output of north France. There are manufactories of velvet-pile carpets, woven goods, and furniture stuffs, also cotton, linen, and silk mills, dye works, machine shops, and a sugar refinery. Tourcoing was captured by the Germans in the War which began in 1914. It was later damaged by allied aircraft. See War in Europe. Pop., 1901, 79,243; 1911, 82,644.

TOURGÉE, tōōr-zhā′, Albion Winegar (1838–1905). An American novelist, born in Williamsfield, Ohio. He graduated from the University of Rochester (New York) in 1862, receiving his degree while serving in the Federal army. He had been wounded at Bull Run and was discharged, but reëntered the service, only to be taken prisoner at the battle of Murfreesboro, Tenn. Immediately after the war he became an editor and took up the practice of law at Greensboro, N. C. From 1868 to 1875 he was judge of the Superior Court of North Carolina, and was later (1881–84) editor of the *Continent* at Philadelphia. He was appointed United States Consul at Bordeaux in 1897 and was transferred to Halifax in 1903. His numerous novels were founded chiefly on his experience in the South during the Reconstruction period. The list includes: *Toinette* (1874); *A Fool's Errand* (1879), perhaps his best-known work; *Bricks without Straw* (1880); *John Eax and Mamelon* (1882); *Hot Plowshares* (1883); *An Appeal to Cæsar* (1884); *Black Ice* (1888); *Letters to a King* (1888); *Murvale Eastman, Christian So-*

cialist (1890); *An Outing with the Queen of Hearts* (1894); *The Mortgage on the Hip-Roof House* (1896). Tourgée also published several legal books, *North Carolina Code of Civil Procedure* (1878) and *A Digest of Cited Cases* (1879).

TOURMALINE, tōōr′mȧ-lĭn (Fr. *tourmaline*, from Singhalese *tournamal, turamali*, tourmaline). A complex aluminium borosilicate, containing also chromium, iron, magnesium, and the alkalies. It crystallizes in the hexagonal system. According to composition, several varieties are distinguished, as chromium tourmaline, iron tourmaline, lithium tourmaline, magnesium tourmaline, and magnesium-iron tourmaline. It has a vitreous lustre, may be either transparent or opaque, and may be colorless as well as blue, green, red, brown, and black. Some crystals are red internally and green externally, and still others are red at one extremity and green, blue, or black at the other. Tourmaline is the most dichroitic of all gems. The mineral is usually found in granite, gneiss, or mica schist. It occurs also in dolomite, granular limestone, and in certain contact rocks near dikes of igneous rocks, also in rolled pebbles in alluvial deposits. The white or colorless tourmalines are called achroite, the black varieties aphrizite and schorl, while those of various shades of blue are known as indicolite, the red varieties as rubellite, and the green transparent specimens from Brazil are known as Brazilian emeralds. The colored crystallized varieties of tourmaline, when transparent, are highly prized as gems. They are found in Burma, Ceylon, and India, in the Urals, the Harz, and Brazil, while in the United States splendid specimens occur in Maine, especially near Paris. Specimens also occur in Massachusetts, Connecticut, New York, and California. Consult G. F. Kunz, *Gems and Precious Stones of North America* (New York, 1892). See Gems.

TOURNACHON, tōōr′nȧ′shôɴ′, Félix (1820–1910). A French author, artist, and aĕronaut, better known under the pseudonym Nadar. He was born in Paris, studied medicine at Lyons, and returned to Paris as a journalist. In 1849 he founded the *Revue Comique* and in 1854 published *Le Panthéon-Nadar*, a gallery of contemporary celebrities. He soon afterward engaged in experiments in aĕrial navigation and constructed *Le Géant*, the largest balloon hitherto made. In it he made a number of ascensions and was once carried as far as Hanover. During the siege of Paris by the Prussians he made use of his knowledge as an aĕronaut to carry information to the outside country and commanded the company of aĕronauts of the Place Saint-Pierre, Montmartre. Among his numerous published works are: *La robe de Déjanire* (1841; 2d ed., 1859); *Quand j'étais étudiant* (1856); *Mémoires du Géant* (1864); *Le droit au vol* (1865); *Les ballons en 1870* (1871); *Le monde où l'on pataugé* (1883).

TOURNAI. See Tournay.

TOURNAMENT, tōōr′nȧ-ment (OF. *tournoyement, tournoiement*, from *tournoier*, to joust, tilt, tourney, wheel about, from *tourner*, to turn, from Lat. *tornare*, to turn in a lathe, from *tornus*, from Gk. *τόρνος*, compasses, carpenter's chisel). A knightly sport of the Middle Ages, in which combatants engaged one another with the object of exhibiting their courage, prowess, and skill in the use of arms. It existed first probably in France, whence it spread to Germany and England and afterward to the south of Europe. A tournament was usually held on the invitation of some prince, who sent a king-of-arms or herald through his own dominions and to foreign courts. The intending combatants hung up their armorial shields on the trees, tents, and pavilions around the arena for inspection, to show that they were worthy candidates for the honor of contending in the lists in respect of birth, military prowess, and character. The combat took place on horseback, or at least was always begun on horseback, though dismounted combatants frequently continued it on foot. The usual arms were blunted lances or swords; but the ordinary arms of warfare, called arms *à l'outrance*, were sometimes used by cavaliers who were ambitious of special distinction. The prize was bestowed by the lady of the tournament on the knight to whom it had been adjudged, he reverently approaching her and saluting her and her two attendants. The period when tournaments were most in vogue comprised the twelfth, thirteenth, and fourteenth centuries; and the place where the most celebrated English tournaments were held was the tiltyard near St. James's, Smithfield, London. The Church at first discountenanced tournaments, some of its decrees prohibiting persons from engaging in them under pain of excommunication and denying Christian burial to a combatant who lost his life in one. The Church seems, however, to have looked with more favor on these combats after the middle of the thirteenth century. During the fifteenth and sixteenth centuries tournaments continued to be held, but the alteration in the social life and warfare of Europe had changed their character, and they are rather to be regarded as state pageants than as real combats. The death of Henry II of France, in 1559, consequent on the loss of his eye at a tournament, led to their general abandonment, both in France and elsewhere.

Military Tournaments. The modern military tournament embraces all the personal skill in the use of arms of the ancient chivalric tournament and has much of its pageantry. New inventions and contact with many nations have incorporated into military necessities and pastimes many novelties unknown in ancient times, and these find their supreme exposition in the national tournaments of both America and England. There is no mystery about the origin of the modern military tournament; data, place, and reason are all available. In 1878 the staff of the Military Gymnasium, Aldershot, gave an exhibition of military exercises at the Albert Hall in London in aid of the widows and orphans of the British soldiers killed in the Zulu War. It was of necessity very limited in its functions; but the next year a fully organized competition in the use of weapons of offense and defense, between all branches of the service, cavalry, infantry, artillery, engineers, and hospital corps, was held. The programme was (and still is) practically divided into two parts: one coming strictly within the line of military duty, such as feats of strength and skill with sword, lance, sabre, and bayonet, and horsemanship, including riding and driving; the other division consisting of sports and pastimes, such as tent pegging, mounted wrestling, etc. To such an extent did the desire to compete extend in Great Britain that it has become necessary to impose the restriction of passing through and obtaining the first place in merit in a district tournament as a condition precedent to competition at the national tournament. The peg used in tent pegging is an ordinary wooden tent peg 3 inches broad and 1 foot long, driven nearly perpendicular into the ground until less than one-half of it is in sight. The trooper rides at the gallop, strikes it if possible, and, without relaxing the grasp of his lance or the speed of his horse, wrenches the peg out of the ground and carries it away on his lance point.

In America the military tournament held each year in Madison Square Garden, New York, has become a recognized institution. It differs from the British tournament in that the latter consists of competitions as well as of exhibition performances, while in America it is made up entirely of exhibition work. The tournaments have been regularly held since 1897. Consult: Dillon, "Tilting in Tudor Times," in *Archæological Journal*, vol. lv (London, 1898–99); A. Schaer, *Die altdeutschen Fechter und Spielleute* (Strassburg, 1901); J. L. Weston, *The Three Days' Tournament: A Study in Romance and Folk-Lore* (London, 1912); K. G. T. Webster, "The Twelfth-Century Tourney," in *Anniversary Papers*, by colleagues and pupils of G. L. Kittredge (Boston, 1913).

TOURNAY, tōōr'nā', or **TOURNAI**. The capital of an arrondissement and the largest town in the Province of Hainault, Belgium, 48 miles south by west of Ghent, on the Scheldt River, here spanned by several bridges (Map: Belgium, B 4). The most striking edifice is the twelfth-century cathedral of Notre Dame in the Romanesque style. The nave, dating from 1146, and the façade with its porch and sculptures are of special interest. Other architectural features of the town include the twelfth-century belfry, the church of Saint-Quentin in the Transitional style, the church of Saint-Brice, with the tomb of Childeric, and the church of Saint-Jacques. The thirteenth-century bridge, the art gallery, the museum of natural history, and the old monastery buildings, now utilized as the municipal headquarters, are also noteworthy. The public library has 60,000 volumes. Manufacturing is the principal industry, the town being noted for its carpets and high-grade porcelain. Cotton and woolen goods, linen, and liquors are also produced. Pop., 1900, 35,004; 1910, 37,523. Tournay, the ancient Civitas Nerviorum or Turnacum, was for a time the capital of the kingdom of the Franks. A bishopric was founded here in 484. The town was at various times and for long periods a possession of France, which finally relinquished it in 1748. It is famous for the gallant defense made by its garrison, under the Princess d'Epinoy, against Alexander of Parma in 1581.

TOURNEFORT, tōōrn'fōr', Joseph Pitton de (1656–1708). A French botanist, born at Aix, Provence. After having explored the flora of his native district, he was sent, at the King's expense, to Spain, Portugal, England, and Holland, the Grecian Archipelago, and Thrace, the shores of the Black Sea, and Asia Minor, and other parts of the East, adding many species to the list of known plants. He published several botanical works and a *Voyage to the Levant* (1717). His botanical system, which maintained its ground till the time of Linnæus, was of great use in promoting the progress of botany, but he rendered still greater service to science by grouping plants in general and is regarded, therefore, as the founder of genera.

TOURNEUR, Turnour, or Turner, tĕr'nĕr, Cyril (?1575–1626). An English dramatist. He found employment in the Low Countries and served as secretary to Sir Edward Cecil in the expedition to Cadiz (1625). He is the author of two plays, *The Atheist's Tragedie* (written probably about 1603, published 1611) and *The Revenger's Tragedie* (published 1607). The latter is a powerful though lurid tragedy, in praise of which Swinburne's fine rhetoric has taken a free rein. Tourneur also wrote elegies and other nondramatic pieces. Consult his *Plays and Poems* (ed. by J. C. Collins, 2 vols., London, 1878); the two plays edited, with Webster, by J. A. Symonds ("Mermaid Series," ib., 1888); and A. C. Swinburne, "Cyril Tourneur," in *The Age of Shakespeare* (New York, 1908).

TOURNEUX, (Jean) Maurice (1849–). A French litterateur and bibliographer, born in Paris. His work is noted for erudition combined with charm of style. He published bibliographies of Prosper Mérimée (1876) and Théophile Gautier (1877); *Diderot et Catherine II* (1899); *Eugène Delacroix* (1902); *J. B. Perronneau* (1903); *Table générale de la Revue d'histoire littéraire de la France, 1894–1898* (1900); *La Tour* (1904); *Léon Sapin* (1906); *Bibliographie de l'histoire de Paris pendant la révolution française* (5 vols., 1900–13).

TOURNIQUET, tōōr'nĭ-kĕt (Fr. *tourniquet*, turnstile, *tourniquet*, from *tourner*, to turn). An instrument for compressing an artery of the thigh or arm, either for the purpose of preventing too great a loss of blood in amputation, or checking dangerous hemorrhage from accidental wounds, or stopping the circulation through an aneurism.

The common tourniquet consists of three parts, viz., (1) a pad to compress the artery, (2) a strong band which is buckled round the limb, and (3) a bridgelike contrivance over which the band passes, with a screw whose action raises the bridge and consequently tightens the band.

To prevent the loss of venous blood during an amputation, it is customary to elevate the limb to a vertical position or to strap it with an elastic bandage for several minutes before the tourniquet is applied. The older forms of tourniquet are now almost universally replaced by a simple rubber strap or piece of rubber tubing which is passed several times around the limb under tension and fastened. This general type is known as Esmarch's tourniquet.

TOURS, tōōr. A city of France, the capital of the Department of Indre-et-Loire. It is 145 miles by rail southwest of Paris, in the rich level valley of the Loire, on the left bank of that stream, and extends 2 miles southward to the Cher (Map: France, N., F 5). The pleasant situation and the equable climate attract many English and American families as sojourners. Two great lines of boulevards, extending throughout the city, cross at its geographical centre, where the modern Palace of Justice adorns a fine square. In this square stands Fournier's bronze statue of Balzac. Saint-Gatien, the stately French-Gothic cathedral of Tours, rises in the northeastern part of the city, near the river. It dates from 1170, was finished about 1550, and is exceptionally complete as to execution. The flamboyant turreted façade is profusely decorated, and the rose window is of an exquisite pattern. Near the centre of the city are the striking detached towers of Saint-Martin and Charlemagne—remains of the celebrated church of Saint-Martin marking the site of the tomb of the saint. The church was rebuilt about the twelfth century in splendid proportions. The structure was torn down in 1802, making way for a street. Near by is the new basilica of Saint-Martin. The ruined château Plessis-lès-Tours, identified with the life of Louis XI, lies just southwest of Tours. Besides the statue of Balzac should be mentioned the statues of Descartes and Rabelais and also the Renaissance fountain.

The city has an art school, a large and a small seminary, the Collège de Saint-Louis de Gonzaga, and a drawing school. The public library contains 170,000 volumes and 2007 manuscripts. In the archiepiscopal palace is a museum of archæology, paleontology art, coins, etc. The Museum of Tours, near the river, has some 500 pictures of small value and collections of sculptures, enamels, antiquities, etc. The city has manufactures of steel, machinery, iron implements, silk stuffs, corsets, leather, confectionery, painted glass, pottery, and chemicals. There are printing works. The trade is very active, both by rail and by river. Pop. (commune), 1901, 64,695; 1911, 73,398.

History. Tours, named from the Gallic tribe of Turones, was an active ally of Vercingetorex against the Romans. It was later the Roman Cæsarodunum. The place became at a very early date the seat of an important bishopric, which soon rose to the rank of an archbishopric. Numerous councils were held here. Tours was taken by the Visigoths in 473 and by Clovis in 507. It is famous for the momentous battle fought in the direction of Poitiers in 732, when Charles Martel (q.v.) repulsed the vast invading army of the Saracens. The city was the capital of Touraine (q.v.). It rose to great importance under the Valois kings, Louis XI in particular favoring the city, which for a time was a great seat of the silk manufacture. The States-General were repeatedly assembled here. In October, 1870, the Government of National Defense was organized at Tours, whence it was removed in December to Bordeaux. The Germans occupied the city from Jan. 10 until March 8, 1871. Consult: Eugène Giraudet, *Histoire de la ville de Tours* (2 vols., Tours, 1873); P. C. A. Grandmaison, *Tours archéologique* (ib., 1879); Casimir Chevalier, *Tours capitale* (ib., 1896); Paul Vitry, *Tours et les châteaux de Touraine* (Paris, 1905); Chanoine Boissonnot, *La cathédrale de Tours: histoire et descriptive* (Tours, 1909).

TOURS, Berengarius of. See Berengarius of Tours.

TOURS, Martin of. See Martin of Tours.

TOURVILLE, to͞or'vēl', Anne Hilarion de Cotentin, Count de (1642–1701). A French admiral. He was born at Tourville, near Coutances, Nov. 24, 1642. He entered the French navy and became a captain at 25, having distinguished himself by service against the Turks and Algerians. In 1669 he participated in the French expedition for the relief of Candia and fought with distinction at Agosta, off the coast of Sicily, in April, 1676, and received the command of a squadron with which in June of the following year he won a decisive victory over the allied British and Dutch off Palermo (June 2). He became lieutenant general of marine and from 1682 to 1688 saw active service against the Barbary pirates, varied by his share in the bombardment of Genoa in 1684. In 1689 he was made a vice admiral and commanded the French fleets in the operations against England and Holland. In June, 1690, he entered the English Channel at the head of a powerful fleet and inflicted a disastrous defeat on the united English and Dutch armament near Beachy Head. In 1692, Louis XIV having decided upon an invasion of England on behalf of James II, a fleet was assembled at Brest under Tourville in order to protect the descent. With 44 ships of the line Tourville assailed an Anglo-Dutch fleet of 82 vessels under Lord Russell off Cape La Hogue and after a desperate fight was decisively beaten (May 29). Tourville, however, suffered no discredit for this defeat, in which his talents and courage were abundantly displayed. In 1693 he was made a marshal of France and in June defeated a British-Dutch fleet under Sir George Rooke off Cape St. Vincent, capturing 27 ships of war and merchant vessels and destroying 45 others. He was subsequently charged with the defense of the Mediterranean coasts of France, but saw no active fighting. He died in Paris, May 28, 1701. Fraudulent *Mémoires* in Tourville's name were published in 1742–58. Consult Delarbre, *Tourville et la marine de son temps* (Paris, 1889).

TOUSSAINT, to͞o'săN', Anna Louisa Geertruida (1812–86). A Dutch novelist, born at Alkmaar, of parents descended from French Protestant refugees. In 1851 she married the architectural painter Jan Bosboom (1817–91) and thenceforth lived at The Hague. The reputation won with her first works, *Almagro* (1837), *De Graaf van Devonshire* (1838), and *De Engelschen te Rome* (1839), was enormously increased on the appearance of *Het huis Lauernesse* (1841; 10th ed., 1885), an historical romance of the Reformation, which was translated into several languages. Among her other historical novels, dealing mainly with English, Dutch, and Spanish scenes, the Leicester trilogy, *Leycester in Nederland* (1846), *De vrouwen uit het Leycestersche tijdvak* (1849–50), and *Gideon Florensz* (1854–55), is the most remarkable. Subsequently she was eminently successful with modern character delineations, of which *Majoor Frans* (1874) is an excellent example. Fine artistic workmanship distinguishes her dialogue tale *Raymond de schrijnwerker* (1880). Her collected works were published in 25 volumes (Arnhem, 1880–88). For her life, consult Jan ten Brink (Amsterdam, 1886).

TOUSSAINT, François Dominique, called l'Ouverture (1743–1803). A Haitian soldier and statesman. He was born near Cape Français in the island of Haiti in 1743 and was a full-blooded negro, his father and mother both being African slaves. He was coachman and afterward assistant to the overseer of his master's sugar plantation and acquired some little education, which he used to good advantage. When the French Revolution broke out, he was the overseer of his master, a planter named De Libertat. A decree of the French Constituent Assembly, May 15, 1791, gave to all free persons of color the privileges of French citizenship, but the white planters of Haiti did everything in their power to delay the application of the decree. On Aug. 23, 1791, the slaves became a factor in the problem by rising in a fierce insurrection. Toussaint took part in the uprising and won a prominent place among the leaders of the insurrection. The revolt was temporarily suppressed, but the repeal by the French Assembly in May, 1792, of the Decree of 1791, reopened the civil war. For a while Toussaint took service with the Spaniards in the east of the island, with whose aid he overran a part of the French territory. Commissioners from France attempted to settle the troubles of the island and finally proclaimed universal freedom in August, 1793. This won Toussaint over to the side of the French Republic, and he came to the front as the recognized leader of his race. The English at this time had seized Port au Prince and were besieging the French Governor, Laveaux, in Port de la Paix. Toussaint went to his assistance, and it was Laveaux who by his exclamation, *Mais cet homme fait ouverture partout*, gave Toussaint the surname *l'Ouverture*, by which he has since been known. In 1796 Toussaint was made commander in chief of the French forces on the island and signalized himself in the following year by compelling the surrender of the English who had invaded Haiti. Hédouville, the French Commissioner, had succeeded in stirring up dissension between the negroes and the mulatto element, and in 1799 a fierce civil war was waged between the blacks under Toussaint and the mulattoes under Gen. André Rigaud. Toussaint succeeded in crushing his opponent, December, 1799. By January, 1801, he had brought the whole island under his power. He now became virtually a dictator, but ruled the island with moderation and firmness and with justice towards the different classes of the population. He had an administrative council of nine, eight of whom were white men. A constitution was drawn up, providing for free trade and naming Toussaint life President. After the Treaty of Amiens had freed him temporarily of danger from England, Napoleon proclaimed the reëstablishment of slavery in the island. Toussaint replied by a declaration of independence in July, 1802. Napoleon sent General Leclerc with 30,000 men to reduce the Haitians to submission. Leclerc was joined by many of Toussaint's enemies, among them being Rigaud and the future rulers, Pétion and Boyer. Toussaint was treacherously arrested, taken to France, and imprisoned without trial in the Château Joux, near Besançon, where he died, April 27, 1803, from cruelty and neglect. Consult his *Mémoires, précédés d'une étude historique et critique* . . . by Saint-Remy (Aux Cayes, Haiti, 1853); J. R. Beard, *Toussaint L'Ouverture: A Biography and Autobiography* (Boston, 1863); T. P. Gragnon-Lacoste, *Toussaint L'Ouverture, général en chef de l'armée de Saint Domingue, surnommé le premier des Noirs* (Bordeaux, 1877), based on the l'Ouverture family papers; Victor Schoelcher, *Vie de Toussaint L'Ouverture* (Paris, 1889); C. W. Mossell, *Toussaint L'Ouverture: The Hero of Saint Domingo* (Lockport, N. Y., 1896); also Wordsworth's poem, "To Toussaint L'Ouverture."

TOUSSAINT-MAIZEROY, René. See Maizeroy.

TOUT, tout, Thomas Frederick (1855–). An English historian, born in London, and educated at Balliol College, Oxford (M.A., 1882). He was a fellow of Pembroke College and also professor at St. David's College, Lampeter, until 1890, when he was appointed to the chair of mediæval and modern history in Manchester University. In 1912–13 he lectured at Oxford. His publications include: *History of England for Schools* (2 vols., 1890, 1898), with Prof. York Powell; *Analysis of English History* (1891); *Edward the First* (1893); *The Empire and the Papacy* (1898); *History of Great Britain* (3 vols., 1902–06); "Germany and the Empire," in *Cambridge Modern History* (vol. i, 1902); *History of England, 1216–1377*, vol. iii of Longman's *Political History of England* (1905); *The Place of the Reign of Edward II in English History* (1914).

TOWAGE (from *tow;* connected with AS. *tēon*, Goth. *tiuhan*, OHG. *zogan*, *ziohan*, Ger. *ziehen*, to draw, Lat. *ducere*, to lead). Assistance in propelling or drawing rendered by one vessel to another. Towing is usually done by tugs, but the service may be performed by any sort of vessel. Where such service is rendered to vessels which have been injured it becomes salvage (q.v.). A vessel thus assisted is commonly referred to as a tow. A tug is not held to the strict responsibility of a common carrier and is liable only for lack of reasonable skill in such service and for negligence. The master of the tug is obliged to see that the tow is properly made up, having regard to the voyage to be made; must have skill in navigation and be reasonably familiar with the course to be followed. The master of the tow must follow all reasonable orders of the master of the tug as to steering, etc. A tug should not abandon a tow except in cases of extreme necessity, and, in general, it may be said that it must seem inevitable that the tug will be lost unless the tow is abandoned in order to justify that course. The charges for towage constitute a maritime lien upon the tow, which will follow it until paid. All questions of towage are governed by admiralty law. Consult the authorities referred to under Admiralty Law. See Rules of the Road.

TOWAN'DA. A city and the county seat of Bradford Co., Pa., 80 miles northwest of Wilkes-Barre, on the Susquehanna River, and on the Lehigh Valley and the Susquehanna and New York railroads (Map: Pennsylvania, J 2). It has a public library and fine high-school and courthouse buildings. Towanda is known primarily for its industrial interests, which include flour, planing, and silk mills, a foundry and machine shop, dye works, and manufactories of talking machines, cut glass, toys, and furniture. Towanda was settled in 1770 and first incorporated in 1828. Pop., 1900, 4663; 1910, 4281.

TOWER (AS. *tur*, from Lat. *turris*, Gk. *τύρρις, tyrris, τύρσις, tyrsis*, tower). Generally, a building higher than its horizontal dimensions. In antiquity the tower was used chiefly as a lookout or for defense and occasionally for lighthouse purposes, though the form of those buildings is not accurately known. In connection with ancient and mediæval fortifications the term is applied to structures but little higher than the adjacent walls. A special form of fortress tower was the keep or donjon (q.v.). In mediæval Italy strong lookout towers were often erected by powerful families in the cities, and those of Bologna (Garisenda, Asinelli, etc.) and San Gimignano are still standing. The civic belfries of Bruges, Ghent, and other Flemish cities were not merely bell towers, but visible tokens of municipal or communal liberties and privileges. In the Far East the tower is associated with the double purpose of commemoration and religious sacrifice, in such buildings as the stupa and tope (q.v.) of southern Asia and the paoh-tah or octagonal tower of China. The lofty wooden pagodas connected with the temples of Japan are emblematic and commemorative features of the temple group and no more.

(For the wide use of the tower in Mohammedan architecture, see Minaret.) The round towers of Ireland, long the subject of animated controversy, have such small window openings that it is evident they were not intended as bell towers. They are very slender, high, and costly in comparison with the humble churches which stand near them; and the soundest conclusion seems to be that they were intended partly as watchtowers, partly as places for the deposit of valuables in the case of sudden forays. In the Christian world the tower appears in Italy at an early time and at least as early as the eighth century, perhaps in the sixth, in the two round bell towers at Ravenna of San Apollinare Nuovo and San Apollinare in Classe. In Italy the detached and separate tower (see Campanile) held its own until the complete disappearance of mediæval architecture in the fifteenth century, and many of the civic towers of the Italian cities rival those of the great churches; but in northern Europe it is found incorporated with the main structure of the church at a period at least as early as the eleventh century. The tower generally stands upon the ground, with its vertical lines easily seen from foundation to summit; and this remains true throughout the Middle Ages, except for the central towers of the cruciform churches. The last-named towers are built over the open interior and are supported on four great arches or groups of arches, spanning the four sides of the crossing of nave and transept. Nearly all of these towers were originally designed to carry lofty spires (q.v.), but in many cases these were never built.

The complete Gothic cathedral was intended to have seven towers—two to the west front, four to the transept fronts, and one over the crossing. (See Bell Tower; Belfry; Campanile; Leaning Tower; Minaret.) These mediæval towers and spires are among the most impressive and beautiful features of the Old World architecture. The Renaissance developed several types of tower and steeple, especially in England after 1650, whence the Wren-Gibbs type was carried into American Colonial church architecture. There are a few fine Renaissance towers in Italy, notably that of San Giorgio Maggiore at Venice; hardly any in France or Germany. Modern towers of note (apart from such monuments as those of Bunker Hill and Washington) are not numerous. The loftiest is the Eiffel Tower at Paris (1889), of steel, 300 meters (980 feet) high, used as a scientific observatory; the tower of the Sacré Cœur on Montmartre, Paris; the Victoria Tower of the London Houses of Parliament; and the church towers completed in modern times in Germany. (See Spire.) Some tall office buildings (q.v.) in the United States are really lofty towers. Consult: Charles Wickes, *Spires and Towers of Mediæval Churches of England* (3 vols., London, 1859); Conrad Sutter, *Thurmbuch: Thurmformen aller Stile und Länder* (2d ed., Berlin, 1895); A. P. Heywood, *Bell Towers and Bell Ringing* (New York, 1914); W. G. Rice, *Carillons of Belgium and Holland* (ib., 1914). See Leaning Tower.

TOWER, tou'ẽr, Charlemagne (1848–). An American capitalist and diplomat, born in Philadelphia. He was educated at Harvard. From 1882 to 1887 he was president of the Duluth and Iron Range Railroad and managing director of the Minnesota Iron Company. He then removed to Philadelphia, where during the next 10 years he was an officer in various important corporations. He was United States Minister to Austria-Hungary from 1897 to 1899 and was Ambassador to Russia from 1899 to 1902 and to Germany from 1902 to 1908. He published: *The Marquis de La Fayette in the American Revolution* (2 vols., 1895); *Catalogue of a Collection of American Colonial Laws* (1890); *Essays Political and Historical* (1914).

TOWER, William Lawrence (1872–). An American zoölogist, born at Halifax, Mass. He was educated at the Lawrence Scientific School (Harvard), the Harvard Graduate School, and the University of Chicago (B.S., 1902), where he taught thereafter, becoming associate professor in 1911. He did important experimental work in heredity, investigating especially the laws of heredity in beetles and publishing *An Investigation of Evolution in Chrysomelid Beetles of the Genus Leptinotarsa* (1906). He published also *The Development of the Colors and Color Patterns of Coleoptera* (1903) and, with Coulter, Castle, Davenport, and East, an essay on *Heredity and Eugenics* (1912).

TOWER, Zealous Bates (1819–1900). An American soldier, born at Cohasset, Mass. He graduated with first honors at West Point in 1841, served under General Scott in the Mexican War, led the storming column at Contreras, and was wounded at Chapultepec. At the outbreak of the Civil War he was chief engineer in the defense of Fort Pickens. In November, 1861, he was made brigadier general of volunteers and on Aug. 30, 1862, was severely wounded at Manassas. After recovering he was superintendent of West Point from July until September, 1864. He then became chief engineer of the defenses of Nashville, Tenn., and his skillful work at that place contributed to the total defeat of General Hood in December, 1864. He was brevetted major general in the United States army in March, 1865, and in November of that year became lieutenant colonel in the Engineer Corps. He was promoted colonel in January, 1874, and retired in 1883.

TOWER BRIDGE. A drawbridge spanning the Thames just below the Tower of London, opened in 1894. The carriage way, at a height of 29½ feet, consists of two approaches of 270 feet and a central span of 200 feet, with a rising draw formed by twin bascules, which can be raised in a minute and a half. There is an elevated footway above the draw, which is used when the draw is open, 142 feet above the river, reached by elevators and stairs. The Gothic towers are of steel and masonry. The cost was over £1,000,000.

TOWER CLOCKS. See Clock.

TOWER HILL. An elevation northwest of the Tower of London, formerly the public place of execution for persons sentenced for treason. Here many of the most noted men of England were put to death, their bodies being buried in the adjacent chapel of St. Peter ad Vincula.

TOWER OF BABEL. See Babel, Tower of.

TOWER OF LONDON. In feudal days a powerful fortress and long afterward a state prison of gloomy memories. It is now a government storehouse and armory. It is a collection of buildings in the form of an irregular quadrilateral on the north bank of the Thames, and on the east side of the city of London. The space occupied is between 12 and 13 acres of rising ground, and the whole is surrounded by a broad but shallow moat, now dry. The moat is bordered within by a lofty castellated wall, with massive flanking towers at frequent intervals. Within this wall rises another of similar construction, but of greater height, within which are the various barracks and armories; and in the centre of all is the lofty keep or donjon known as the White Tower. This last-named building, erected by the Bishop of Rochester in the time of William the Conqueror, is the most interesting in the whole structure. Its walls are in parts 16 feet thick and of solid masonry. The White Tower was the court of the Plantagenet kings, whereas the various other towers are principally noteworthy on account of the illustrious prisoners who have been confined in them. The southeast angle of this tower is occupied in its upper part by the chapel of St. John, the oldest place of worship in London, a perfect example of the early Anglo-Norman style. The rest of this tower is occupied by the old state apartments and the royal Armory, which contains a collection of ancient and mediæval arms and armor, the latter exhibited in complete suits on wooden figures of men and horses. Some of these figures represent English kings arrayed in the armor which the kings actually wore while living. The Wakefield Tower contains the Jewel Office, in which are exhibited the magnificent crown jewels, sceptre orb, and some of the royal gold service. To the Jewel Office and the Armory visitors are admitted on payment of a small fee. In the northwest corner of the quadrangle is St. Peter's Chapel, now the garrison church.

Early writers have alleged that Julius Cæsar built the Tower of London as a Roman fortress. The spot was in fact occupied by some structure before the time of William the Conqueror, as is shown by the massive foundations discovered in the course of later erections; but of the nature of these earlier buildings we know little. The White Tower, already mentioned, is the beginning of the historical Tower of London. During the reigns of the first two Norman kings the Tower seems to have been used as a fortress merely. In Henry I's time it was already a state prison. That monarch and his successors gradually increased the size and strength of the ramparts and towers, until the whole became a great feudal stronghold. The kings frequently lived there, holding their courts, and often sustaining sieges and blockades at the hands of their rebellious subjects. On the accession of Queen Elizabeth, however, the Tower ceased to be a palace. Of the long list of executions for political offenses which it witnessed, those occurring during the war which began in 1914 were the first after those of the rebellion of 1745.

In 1841 a fire broke out in the Bowyer Tower, and extended to the armories, causing the destruction of numerous modern buildings and many thousand arms. At present the Tower of London is in charge of the War Department and contains arms and accoutrements for the complete equipment of a large army. The mint and public records were formerly kept in it, but have now been removed to more suitable buildings. The government of the Tower is vested in a constable, who has great privileges and is usually a military officer of long service and distinguished rank, whose position is honorary; the deputy constable, also an officer of repute, is the actual governor. He has under him a small staff and the corps of yeomen of the guard, more commonly known as beefeaters. See BEEFEATER.

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TOWER OF THE WINDS. An octagonal building, north of the Acropolis of Athens, belonging to the second or first century B.C., 42 feet high and 26 feet in diameter, bearing on the upper part of each side the sculptured symbol of a wind. It was originally surmounted by a bronze weathercock in the form of a Triton. Besides indicating the direction of the wind, the exterior walls were marked to serve as a sundial, and there appears to have been within the tower a water clock, the method of operating which has not been clearly ascertained. It is also called the Clepsydra of Andronicus Cyrrhestes.

TOWER SHELL. One of the elongated, tightly coiled shells of the gastropods of the family Turritellidæ, allied to *Vermetus* (see WORM SHELL), about 131 species of which are known from the warmer seas, and many fossil forms. Most of them are covered with a brownish epidermis, which, when removed, exhibits a delicately sculptured and often finely colored surface. Only the lower part of the spiral is occupied by the adult animal, the distal half of the shell being partitioned off.

TOWER SHELL.

TOWERS OF SILENCE. The structures upon which the Parsis (q.v.) and Ghebers (q.v.) expose the bodies of their dead to be devoured by vultures, or sometimes dogs, in accordance with the precepts of their religion as taught by Zoroaster (q.v.). The prescription for building these structures is as old as the Avesta (q.v.), where they are called Dakhmas. The best modern specimens are to be seen on Malabar Hill, Bombay, India, and across the Bombay harbor at Ooran; there is also one near Teheran and another near Yezd in Persia, where the ruins of a deserted tower are likewise to be seen. Though the older shape of the Dakhmas seems to have been rectangular, the modern towers are circular. The best constructed are of massive stone or of bricks covered with cement. They are 20 or 30 feet high, 75 to 100 in diameter, and they resemble huge gas reservoirs in form, with a small door at one side for the entrance of the bodies. The top is open to the sky; the floor below is built of large slabs of stone; in each slab is a slight depression, called a pavi, in which the body is laid for the "heaven-sent birds" to devour. Small ducts lead from every pavi into the central pit where the bones are placed after they have been denuded of flesh by the vultures, which is often accomplished in a few hours. From this central well there run four drains, at right angles, to carry away any deposit that might remain and conduct it through quicklime, sand, and other absorbents lest the earth might be defiled by its contact. Herodotus (*Hist.*, i, 140) alludes to this method of disposing of the dead in ancient Iran, and the Zoroastrians, who still keep up the practice, maintain that it is a solution of the sanitary question. Consult: D. Karaka, *History of the Parsis* (2 vols., London, 1884); Modi, *A Tower of Silence* (Bombay, 1885); id., *Funeral Ceremonies of the Parsees: Their Origin and Explanation* (2d ed., ib., 1905); A. V. W. Jackson, *Persia Past and Present* (New York, 1906).

TOWHEE. See CHEWINK.

TOWLE, tōl, GEORGE MAKEPEACE (1841-93). An American historian and journalist, born in Washington, D. C. He graduated at Yale in 1861 and at the Harvard Law School in 1863 and practiced law in Boston. He was United States Consul at Nantes (1866-68) and at Bradford, England (1868-70), was managing editor of the Boston *Commercial Bulletin* (1870-71), foreign editor of the Boston *Post* (1871-76), and later was connected with *Appleton's Journal*, the *Art Journal*, and the *Youth's Companion*. His works include: *History of Henry the Fifth, King of England* (1866); *The Eastern Question* (1877); *Principalities of the Danube* (1877); *Beaconsfield* (1878); *Young Folks' Heroes of History* (1878-82); *Modern France, 1851-79* (1879); *Certain Men of Mark* (1880); *England and Russia in Asia* (1885); *England in Egypt* (1885); *Young People's History of England* (1886); *Young People's History of Ireland* (1887).

TOWN (AS. *tūn*, OHG. *zūn*, Ger. *Zaun*, hedge, inclosure; connected with Ir. *dūn*, Welsh *din*, hill fort). The name applied generally throughout the United States to small municipalities or urban communities between the village and the city. In New England it more often denotes a quasi-corporate area, either urban or rural, constituting a subdivision of the county, which elsewhere is usually called the township or supervisor's district. (For the urban town, see MUNICIPALITY, OR MUNICIPAL CORPORATION.) The New England town is the most important local administrative unit in the governmental system. The centre of political activity is the town meeting, which meets usually once a year and may be attended by all the legal voters of the town. It discusses measures of common interest to the town, elects the town officers, and votes the taxes for the ensuing year. The government of the New England town is therefore a pure democracy and the only real example of the kind in the American political system. The town meeting governs through a body of officers, varying according to the needs of the community. These are usually the selectmen, varying in number from three to nine, who are the executive magistrates of the town, the town clerk, treasurer, constables, tax assessors, overseers of the poor, and school trustees. In some towns there are such officers as field drivers, pound keepers, fence viewers, measurers, sealers, etc. In England the word "town" applies to the small municipalities as in the United States, although the word "borough" is used to designate certain of the old towns. See TOWNSHIP. Consult: Edward Channing, *Town and County Government in the English Colonies of North America* (New York, 1884); J. A. Fairlie, *Local Government in Counties, Towns and Villages* (ib., 1906); Bryce, *American Commonwealth* (new ed., 2 vols., ib., 1910); C. A. Beard, *Readings in American Government and Politics* (ib., 1914).

TOWN CROSS. See CROSS.

TOWN, ITHIEL (1784-1844). An American architect, born at Thompson, Conn. In partnership with Alexander J. Davis he opened an office in New York City in 1829; and with him designed the old State capitol (demolished) of Connecticut at New Haven, the capitols of Indiana and North Carolina, the former city hall at Hartford, Conn., and several interesting churches in New Haven and Hartford. Town built also several government buildings at Washington and a number of bridges, including one over the James River near Richmond, Va. His works represent the transition from the expiring Georgian style to the Greek and Græco-Roman types of the Classical Revival in America. They reveal a refined taste both in composition and in detail. He was one of the original members of the National Academy of Design, New York. A large part of his extensive library on art went to Yale College. His publications include *Description of Improvements in the Construction of Bridges* (1821) and *Atlantic Steamships* (1838).

TOWNE, HENRY ROBINSON (1844-). An American manufacturer, born in Philadelphia. He studied at the University of Pennsylvania in 1861-62 and then became a draftsman for the Port Richmond Iron Works. In 1863-66, for the national government, he had charge of work on gunboats and monitors. In 1868 he became associated with Linus Yale in the manufacture of locks and after Yale's death in 1868 became president of the Yale & Towne Manufacturing Company at Stamford, Conn. In 1889 he was president of the American Society of Mechanical Engineers and in 1908-13 of the Merchants' Association of New York. He wrote *A Treatise on Cranes* (1883) and *Locks and Builders' Hardware* (1904).

TOWNELEY, CHARLES (1737-1805). An English archæologist and collector of classical antiquities. He was born at Burnley, Lancashire, was educated at Douai College and under the tutorship of John Tuberville Needham. Upon visiting Rome and Florence, in 1765, he became interested in antiquities, which, after receiving advice from Winckelmann and other archæologists, he began to collect in 1768. In 1772 he bought two houses in Park Street, Westminster, London, where he deposited his collection. He made frequent visits to Rome and until 1780 continued to add to his acquisitions, including the Nollekens (q.v.) collection. In 1786 he was chosen a member of the Society of Dilettanti and in 1791 trustee of the British Museum. After his death his marbles and terra cottas were purchased by the British Museum for £20,000, and in 1814 his bronzes, coins, gems, and drawings were also acquired. His collections in the Museum are described and illustrated by Ellis, *Townley Gallery* (London, 1846).

TOWN HALL. A building for the legislative and administrative business of a town or city, containing usually the public offices of the mayor and various municipal administrations, and the chambers for the meetings of the legislative bodies of the city (aldermen, council, etc.). In small towns court rooms and a jail are added, and a large public hall is also often provided. A belfry and clock tower is a feature of nearly all French, German, Flemish, and British town halls and of many of the more notable American examples. The French include a *salle des mariages* in their town halls and treat with especial effectiveness the entrances, lobbies, and grand stairways.

The oldest examples of the town hall in Europe belong to the Middle Ages. They date from the time of recognition of the right of municipal self-government, of which they are the expression. In southern France the town hall of Saint-Antonin (twelfth century) is one of the oldest in Europe. In Italy there grew up by the thirteenth century almost as many states as cities, each of which provided itself in time with one or more municipal buildings according to its particular form of administration. Of these the greater part date from the late thirteenth and the fourteenth centuries, some of the most important being those at Cremona (1245); at Siena the superb red-brick Palazzo Pubblico with its slender tower (1289); at Pistoia the two palaces del Podestà and del Communale (1294–1385); at Florence the vast Palazzo Vecchio (1298), with its impressive tower overhanging the street; the Doge's Palace at Venice; the elegant Palazzo del Consiglio at Verona (1473). The Renaissance added but few to the Italian list. In Germany the *Rathaus*, or municipal council house, appears in the fourteenth century (e.g., Brunswick), but the finest and most numerous examples belong to the Renaissance, as at Bremen, Cologne, Lübeck, Altenburg, Augsburg, and Nuremberg, with picturesque towers and high gables. Very notable are the sumptuously ornate Belgian town halls of the fourteenth and fifteenth centuries at Brussels, Louvain, Ghent, Bruges, Courtrai, Arras in France (destroyed in the Great War), and Oudenarde, and the fine Renaissance structure at Antwerp. But few mediæval town halls remain in France, that of Compiègne being the finest (late fifteenth century).

The Renaissance gave France the fine town halls of Beaugency, Rheims, Rouen, Lyons, and Paris, the last two now replaced by modern edifices, recalling the original structures. The Paris example is the largest and most splendid of modern town halls, especially in its interior decorations. In Great Britain it was not until the nineteenth century that the town hall became important; it forms one of the most interesting and successful subjects of recent architectural design, as, e.g., at Sheffield and at Oxford. The town hall at Hamburg is the finest of recent German works in the same line, far superior to the modern Gothic town hall at Vienna.

In the United States the Philadelphia city hall is the largest and ugliest of modern examples; that at New York, dating from 1809, one of the most refined and elegant. The earlier town halls of the United States follow Colonial or "Greek revival" models; the later ones are in the style of the French Renaissance or in what may be called the neo-Roman style. Early in the twentieth century the tower or skyscraper type came into use for town halls (e.g., Los Angeles, Cal.) and municipal offices (Municipal Building, New York). See MUNICIPAL ARCHITECTURE.

TOWNLEY, JAMES (1714–78). An English clergyman and dramatist, born in Barking, near London. He was educated at the Merchant Taylors' School, London, and at St. John's College, Oxford. After holding various preferments in the Church, he was appointed, in 1760, head master of the Merchant Taylors' School and in 1772–77 was vicar of Hendon in Middlesex. He is best remembered as the author of the satirical farce *High Life below Stairs* (Drury Lane, Oct. 31, 1759), which has been translated into French and German and has been performed throughout the world. It was formerly attributed to Garrick. Two other farces written by Townley did not succeed. Consult J. Genest, *Some Account of the English Stage*, vol. iv (Bath, 1832).

TOWNLEY, JAMES (1774–1833). An English minister of the Wesleyan denomination. He was born in Manchester. He was president of the Wesleyan Conference in 1829. As a scholar he was second only to Adam Clarke in the denomination. His most important work was *Illustrations of Biblical Literature, Exhibiting the History and Fate of the Sacred Writings, Including Notices of Translators and Other Eminent Biblical Scholars* (3 vols., 1821; 2 vols., 1842).

TOWN PLANNING AND HOUSING. Town planning, or city planning, and housing are so closely related that one cannot be considered without reference to the other. But since city planning (q.v.) has been treated in the article under that title, reference to it here will be merely incidental. Housing, as the term is now understood, has to do with all dwellings. Until comparatively recently the attention of housing workers was concentrated upon the dwellings of the poor. Even in America, where class distinctions are not so generally recognized, it began with the same attitude of mind, as indicated by the word "tenement" in the legislation. But the change in the United States has been more rapid than in Great Britain. In the United States it was early found that the popular distinction between tenement house and apartment house was not tenable when requiring minimum standards. Here, as everywhere, it was the poor who suffered most from bad housing conditions. As is not the case in England, the poor in the metropolis, to whom attention was first directed, lived in tall, row tenement houses. Consequently it was they for whose benefit the earliest efforts were made. But when the first really effective law was drafted, the New York Tenement House Law of 1901, it was found that the minimum requirements for certain fundamentals, such as light and air, were greater than were provided by the builders of many expensive apartment houses. Since the words "tenement house" as used in this law include "any house or building, or portion thereof, which is rented, leased, let, or hired out, to be occupied, or is occupied, as the home or residence of three families or more living independently of each other, and doing their cooking upon the premises, or by more than two families upon any floor, so living and cooking," they cover the most expensive apartment houses as well as the cheapest tenements. The result is that "new law" tenement houses, i.e., erected since the enactment of the Law of 1901, on the lower east side are better lighted and ventilated than many "old law" apartment houses in fashionable districts.

The long struggle to secure effective housing legislation in New York attracted attention throughout the country, and many other cities enacted tenement-house legislation based upon that of the metropolis, though the worst of their housing was to be found not in multiple dwellings but in unsanitary shacks and hovels. Once these cities had passed beyond the purely imitative stage and had begun to study their needs, they discovered that what they required was not tenement-house regulation applicable only to the type of dwelling prevalent on Manhattan, but housing regulation applicable to all dwellings. The first American city to act upon this discovery was Columbus, Ohio, which in 1911 passed an ordinance that covers one and two-family houses as well as tenement houses. Since then the application has been made still wider, and the later codes cover "any house or building or portion thereof which is occupied in whole or in part as the home, residence, or sleeping place of one or more human beings, either permanently or transiently." (Housing Ordinance, Grand Rapids, Michigan, 1914.)

Relation of Town Planning and Housing. Further study of the housing problem showed that even this was not sufficient. Regulation of individual houses, essential as it is, cannot alone produce housing of the standard now demanded. So the housing worker has been drawn into city planning. The size and shape of lots are matters of first importance to him, for these influence the type and character of the dwelling; and size and shape of lots are largely determined by the size and shape of blocks, i.e., by the direction and arrangement of streets. Many other problems of city planning also have a direct effect upon housing, as, e.g., that of transportation. Good and cheap transportation makes larger areas accessible and so permits of spreading out the population in houses of good type; inadequate or expensive transportation causes the population to crowd near the centre and raises land values so that only closely packed and multiple dwellings will yield a profit.

The fundamental trouble in the past, that which it is most anxiously sought to prevent in the future, is land overcrowding. This has been almost universal in cities. The convenience of living near the centre, even with modern means of transportation, is the temptation which leads first to overcrowding the land with buildings until adequate open space even for lighting and ventilating the rooms is sacrificed, then to the erection of high multiple dwellings that pile one family above another.

Fortunately the superintensive use of land by the erection of multiple dwellings is not universal. In some countries the multiple dwelling is almost unknown. Even on the continent of Europe Holland and Belgium, despite their dense populations, have escaped it, while in the British Isles England remains essentially a nation of families living in single houses, though Scotland has followed the French tradition and put its people into high tenement houses or landes. The United States and Canada in recent years have shown an inclination to follow continental precedents, but, except in the neighborhood of New York and in New England, where the wooden "three-decker" has obtained a strong foothold, our cities are not of a predominantly tenement character, while some, even among the oldest, like Philadelphia and Baltimore, have refused to welcome the multiple dwelling.

In none, however, have we escaped other ills which go with unregulated growth. Philadelphia packs its little houses together so closely that in some of the oldest districts there is scarcely room for a narrow passageway to the doors of dwellings that occupy what once were back yards. There is no space here, either indoors or out, for proper toilets, several families being compelled to use one convenience, often a filthy privy, placed at the far end of the narrow passageway and directly under the windows of the end houses. Baltimore, Washington, many of the Southern cities, even Chicago, have alley dwellings placed on the rear of lots. Unsanitary conditions; filthy dilapidated privies, surface drainage for all household waste water, decaying accumulations of garbage and other refuse, windowless rooms, cellar dwellings, room overcrowding, prevail to an extent which no city will believe until investigation has produced facts and pictures. (Consult lists of reports on housing conditions in American cities, *National Municipal Review*, October, 1912, and January, 1914.) Even in small cities, in towns, in villages these conditions abound.

American cities and towns are in no way peculiar in this respect. Descriptions of conditions found in neglected sections of European cities and towns, and in those of Australia, might, with change of names, almost be substituted for the descriptions of those found in America. The results of ignorance and neglect, of taking the profit of the moment without regard for the future, have everywhere been the same.

Housing Movement in Europe and America. Public concern for housing is not wholly modern, though the thorough study we are now giving it and the effective measures we are beginning to use are comparatively recent. Eberstadt, in his *Handbuch des Wohungswesens*, states that in Rome in the later period of the Empire a population of between one and two millions was huddled in tenement barracks of many stories. There were 46,602 of these at one time as against 1780 patrician houses. The northern barbarians who overran the Empire were not accustomed to the closely packed cities of the south, but what they found they adopted, and during the Middle Ages, urged by the necessity for keeping their increasing populations behind expensive city walls, even the towns of Germany subdivided their lots and made houses narrower and narrower, clinging to the single family house despite pressure of population. The time came, however, when these old houses must be shared by two or more families, and finally, in the sixteenth century, the tenement house was introduced from Italy to become the characteristic dwelling of the middle and lower classes.

From early times there have been building regulations both on the Continent and in the British Isles. But these dealt chiefly, as do present American building codes, with the protection of property. The need of light and air and cleanliness was scarcely recognized until modern times. So the cities grew more crowded and cleanliness was scarcely recognized until the industrial era, with its great expansion of urban populations, made conditions in towns so unendurable that serious attention was given to making cities fit for people to live in.

England, as the first industrial nation, was perhaps the first to feel the need for regulation which would safeguard the dwellings of its people. Writers with a social vision like Dickens, statesmen like Disraeli, saw the menace to the nation if conditions were not bettered. Parliament passed a series of acts giving greater and greater powers to public officials in the regulation of private property until in the Housing and Town Planning Act, etc., 1909, was enacted a constructive measure which made possible the prevention of future slums by permitting local authorities to town-plan undeveloped areas and impose regulations which would maintain wholesome standards. This act, it was admitted, met but part of the problem, leaving as it did the already built upon areas to be dealt with only according to the fragmentary legislation of the past. Germany was more prompt than England to recognize the social significance of the industrial era. As it came to Germany later than to England, Germany had the advantage of seeing its effects before these had become a part of the national life. Moreover, the nearly universal military service of German youth brought more vividly to the attention of the authorities the evil effect of bad housing in the rapidly growing industrial cities. So regulation of urban development and of housing was quicker and more effective than in England. The results of German thoroughness in this as in other phases of municipal life have been recognized by both American and English students who have frequently called attention to the nonexistence in German cities of the sordid, depressing slums of American and British industrial centres. But Germany has not yet solved its housing problems, as men like Rudolph Eberstadt, Bernhard Dernburg, and Werner Hegemann freely admit. "Berlin," e.g., houses "nearly one-half of its population in one-room dwellings in tall tenements crowded around one or more internal courts."

The Germans have come to see that the fundamental defect in their housing is the type of building, the barrack tenement which they adopted from Italy in the sixteenth century. Their first efforts in town planning and housing reform accepted this type. The desire there was to produce an imposing, a beautiful, and sanitary city. Wide boulevards, impressive public buildings and open spaces, and model tenements engaged their attention. Now they see that wide paved residence streets impose burdens on abutting property which practically necessitate high multiple dwellings, that wide spaces between streets lead to the building of rear tenements about interior courts, and that the model tenement, no matter what advantages it may offer in the way of kindergartens for the children of the tenants or common rooms for the tenants themselves, is not to be compared in social value with the single family house.

Unfortunately, however, the coming of the tenement raises land values so that the single family house becomes economically impossible. Land in German cities is 8 or 10 times as costly as in corresponding sections of English cities, where the single family house is the rule. (Pehlmann.) Yet the Germans have set themselves to the task of encouraging the erection of single family houses and discouraging the erection of tenement houses. They have begun by seeking regulations which will limit the height of dwellings and the proportion of the lot that may be occupied, thereby reducing the value of a particular lot, but spreading this value over areas which under the system of close tenement building would lie undeveloped for many years.

The improvement of housing conditions is a matter of public concern in all countries of western Europe, but the examples of Germany and Great Britain may be taken as illustrative.

In America the housing awakening dates back to about 1910, though in some of the older cities, notably New York, housing reform has been a vital issue since the middle of the nineteenth century. In 1900 Governor Roosevelt appointed a commission, headed by Robert W. deForest, which secured the enactment of a law which worked almost a transformation in the plans of multiple dwellings and provided for effective enforcement by the creation of a Tenement House Department. One and two-family houses were not included in its scope—a matter of increasing importance, since the city extended its boundaries to take in Brooklyn, Queens, and Richmond. This part of the problem was being approached along city-planning lines and in the proposal to district the city, applying different regulations to the different districts.

METHODS USED

As the housing problem is most complicated, many methods are used in its solution. Among these are: regulation, setting definite minimum standards; districting or zoning, setting progressively higher standards for new developments; the creation of garden suburbs or villages; the building of improved dwellings on a limited dividend basis; and the social management of wage earners' dwellings.

. **Regulation.** Regulation is recognized as an essential in all the countries where serious efforts to improve housing are being made. In America it first took the form of tenement-house legislation. Later laws, however, cover all dwellings and include: general provisions; dwellings hereafter erected, light and ventilation, sanitation, fire protection, alterations, maintenance, improvements, requirements and remedies.

After the enactment of the New York law (which applies only to cities of the first class) in 1901, New Jersey enacted (1904) a similar law applying to the whole State. Since then other States (Connecticut, Massachusetts, Indiana, Pennsylvania, California) have enacted laws which apply to all or a large proportion of their cities, and many cities have adopted local ordinances of secured State laws of local application.

Districting. Such general regulations must necessarily be based upon existing conditions in the worst sections of a city or in the worst city of the State. State legislation therefore usually provides that any city may raise the standards it sets. It is proposed that city ordinances be similarly supplemented by districting or zoning regulations which will permit of progressively higher standards being required in new districts or those further removed from the old crowded centres. One of the most promising features of regulation by districts is the power it gives to establish new industrial centres, so relieving the pressure upon the old centre and permitting an increasing proportion of the population to live in homes of good type within easy distance of their work. This is a form of regulation which has been applied in part in several cities, but was not thoroughly worked out until 1916, when a New York City commission submitted a plan for districting the metropolis. So far the efforts have been confined to height regulation and to setting aside certain areas for residence purposes and forbidding their invasion by business or industry.

Garden Suburbs. Simply to apply regulations, which at best are negative, is not sufficient, so the creation of garden suburbs or villages is being undertaken. In these the latest lessons of city planning are applied to secure not only economy and convenience, but also all those attributes of pleasant living which may be grouped under the word "amenities." To the Englishman, accustomed to closely packed towns where solid lines of brick buildings run unbroken to the open country, most of the smaller cities and towns of the United States and the suburbs of the larger cities, with their detached houses and yards, are garden cities and suburbs. The limit of 8 or 10 or 12 houses per acre, which he sets, is one that is scarcely approached in good American developments. But in the planning of the area and the architecture of the houses America is only beginning, as at Forest Hills Gardens (New York) and Roland Park (Baltimore), to realize the possibilities.

Improved Housing. Improved housing includes the garden suburb or village, though, as used in America, the term has generally been confined to the erection and social management of dwellings, often in the older sections of cities, without reference to the town planning which is a characteristic of the garden community. The chief features of improved housing are careful planning of dwellings so as to promote in every way the welfare of the tenants, financing on a limited-dividend basis (usually 5 per cent) so that excess income is used for the improvement of the dwellings or the reduction of rent instead of the profit of the owners, and social management, which, while aiming to secure a fair return upon the investment, also seeks to establish a friendly and helpful relationship between tenant and owner.

In all of these respects the builders of improved dwellings have been of far greater service than is indicated by the number of people for whom they have provided. Alfred T. White, who in 1877 erected his first group of dwellings in Brooklyn, by his demonstration of the fact that dwellings could be planned so as to secure abundant light and air and provide proper sanitary conveniences and yet pay a fair return upon the investment, brought about one of the most important advances in local housing regulation. (Tenement House Law, 1879.) In Washington and in Philadelphia the plans of the improved houses have been used by other builders. But the full benefit was not secured owing to the lack of an organized propaganda such as that conducted in England by the Garden Cities and Town Planning Association, which has spread the idea from one end of the country to the other.

Housing by Employers. Aside from the limited-dividend companies are a considerable number of corporations which have provided for the housing of their employees. Some of these have built villages about their plants which rival in beauty the much better known villages of the Cadburys (Bournville), Lever Brothers (Port Sunlight), and the Rowntrees (New Earswick) in England.

Copartnership. Two methods which have won approval abroad have not yet been tried in America. The copartnership companies, in which the tenants by regular payments in addition to rent gradually acquire stock in the company, so retiring outside capital, have apparently demonstrated their value in England, but up to 1916 only one attempt along similar lines has been made in America. This was at Billerica, Mass., and at that date was not yet in full operation.

Government Aid. This method is that of government loans of cash or credit, usually to municipalities or to approved limited-dividend companies. The details vary in different countries, but a brief description of English procedure must suffice. The money must be used in the erection of workingmen's houses (a workingman is one whose annual income does not exceed £160). After assuring itself that the building conforms to its standards the government will advance 85 per cent of the cost secured by a first mortgage and repayable in annual installments over a period of from 20 to 80 years, usually 30 years. The interest rate varies from 2¾ to 4¼ per cent, but is usually from 3½ to 3¾ per cent.

Canada has made a beginning in government aid through a provincial law which authorizes cities and towns of Ontario to guarantee securities of approved housing companies up to 85 per cent of the total value of the development. Under this act Toronto guaranteed the securities of the Toronto Housing Company, which erected several groups of dwellings. In the United States there have been two definite attempts to secure government aid. The Massachusetts Homestead Commission introduced a bill providing for the loan of State money to be used in building workingmen's dwellings. The Supreme Court of the Commonwealth declared that this bill would be unconstitutional, since it would involve taxation for private rather than public benefit. The Commission therefore prepared an amendment to the constitution permitting the Legislature to authorize the Commonwealth to buy and improve land, build upon it, and sell the same for the purpose of relieving congestion of population and providing homes for citizens, provided the sale was not made at less than cost. This amendment was adopted by a large majority at the general election in November, 1915.

In 1915 bills were introduced in Congress authorizing the loan of government money for the erection of workingmen's dwellings in the District of Columbia. The amount of the loan was not to exceed three-fourths of the value of the property, was to be repaid within 40 years, and was to bear interest not exceeding 4 per cent.

Municipal Housing. Another form of governmental activity in Europe has not received such general approval, and there is no attempt in America to imitate it. This is the building of dwellings by the government itself. Here Germany's experience differs from that of England, especially in the success which has attended municipal operations in Ulm.

Liverpool is the great English example of government house building and management, though many other English cities have undertaken large developments. Necessary as they may have been to improve sanitary and social conditions, they have all been failures financially. Liverpool, however, presents a strong argument even on the financial side by its showing of more than compensating savings in charges for health, police, etc., as a result of its housing schemes. See CITY PLANNING; HOUSING PROBLEM.

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TOWNS, CHARLES B. (?-). An American expert on drug habits. He established a hospital in New York, where he successfully treated persons addicted to the use of alcohol, morphine, opium, tobacco, etc. Towns, who visited China in 1908, opened hospitals at Peking, Tientsin, and Shanghai and cured 4000 opium users. Having at this time fully demonstrated the efficiency of his method, he published it for the benefit of the medical profession. He was author of the restrictive drug legislative act of New York, known as the Boylan Law, which was enacted in 1914. He published *Habits that Handicap: The Menace of Opium, Alcohol, and Tobacco and the Remedy* (1915).

TOWNSEND, CHARLES ELROY (1856-). An American legislator, born at Concord, Jackson Co., Mich. He attended the University of Michigan in 1877-78, was register of deeds of Jackson County in 1886-97, was admitted to the bar in 1895, and thereafter practiced at Jackson, Mich. He served as a delegate to the Republican National Convention in 1888 and from 1898 to 1902 was a member of the Republican State Central Committee. A member of the Fifty-eighth to the Sixty-first Congresses (1903—11), he was reëlected to his seat in the House, but in 1911 became United States Senator.

TOWNSEND, CHARLES HASKINS (1859-). An American zoölogist, born at Parnassus, Pa. From 1883 to 1902 he was connected with the United States Fish Commission, and thereafter was director of the New York Aquarium. He also served as a member of the Bering Sea Fur Seal Commission in 1896 and as an expert before the Russo-American fisheries arbitration at The Hague (1902). In 1912-13 he was president of the American Fisheries Society. He published a number of scientific papers and popular articles.

TOWNSEND, EDWARD WATERMAN (1855-). An American journalist and novelist, notable for his studies of lower New York life and dialect. He was born in Cleveland, Ohio. After a common-school education he became engaged in journalism in New York and attracted attention by sketches of Bowery life done in the picturesque slang of the streets, and contributed to the *Sun* and the *Journal*. These are collected in part as *Chimmie Fadden, Major Max, and Other Stories* (1895); *Chimmie Fadden Explains, Major Max Expounds* (1895), and *Near a Whole City-Full* (1897). *A Daughter of the Tenements* (1895) and *Days Like These* (1901) are novels, also of New York life. Later books are *Chimmie Fadden and Mr. Paul* (1902); *Lees and Leaven* (1903); *Sure* (1904); *Reuben Larkmead* (1905); *Our Constitution* (1906); *Beaver Creek Farm* (1907); *The Climbing Courvatels* (1909). He was elected to the National Institute of Arts and Letters in 1914.

TOWNSEND, GEORGE ALFRED (1841-1914). An American journalist, born in Georgetown, Del. He was educated in Philadelphia and was successively connected with the *Inquirer* and *Press* of that city, the New York *Herald* and *World*, and the Chicago *Tribune*. He first gained distinction as a war correspondent in the Austro-Prussian War (1866). Among his books are: *Campaigns of a Non-Combatant* (1865); *Poems* (1870); *Washington Outside and Inside* (1871); *Tales of the Chesapeake* (1880); *The Entailed Hat* (1884); *President Cromwell* (1885), a drama; *Poems of Men and Events* (1899); *Poems of the Delaware Peninsula.* Much of his newspaper correspondence was over the signature Gath.

TOWNSEND, LUTHER TRACY (1838-). An American Methodist Episcopal theologian, educator, and author. He was born at Orono, Me., and graduated at Dartmouth College in 1859, and at Andover Theological Seminary in 1862. In 1863-64 he served as adjutant in the army. He was professor of Hebrew and Greek in Boston University School of Theology (1868-72), and then professor of practical theology and sacred rhetoric until his retirement in 1893. Among his publication are: *Credo* (1869); *Sword and Garment* (1871); *The Supernatural Factor in Revivals* (1877); *The Intermediate World* (1878); *Story of Jonah in the Light of Higher Criticism* (1897); *Evolution or Creation* (1899); *Anastasis* (1900); *Adam and Eve, History or Myth?* (1904); *God and the Nation* (1905); *The Deluge* (1907); *Bible Inspiration* (1909); *Bible Studies* (1913); *The Stars are not Inhabited* (1914).

TOWNSEND, THOMAS SEAMAN (1829-1908). An American compiler, born in New York City.

From 1860 to 1901 he collected and arranged all important items concerning the Civil War that appeared in the newspapers of the country, thus forming a chronological history of great value to future historians. This enormous collection of 125 volumes is now in the Columbia University Library. It is entitled the *Townsend Library of National, State, and Individual Civil War Records.* He published *Honors of the Empire State in the War of the Rebellion* (1899).

TOWNSEND, William John (1835–). An English Methodist clergyman, born at Newcastle-on-Tyne. Educated at Ranmoor College, Sheffield, he entered the ministry of the Methodist New Connexion in 1860, and was president of the conference in 1886, general missionary secretary (1886–91), and Connexional editor (1893–97). He was president of the National Free Church Council in 1902 and of the first annual session of the United Methodist Conference (1908). Besides helping to edit *A New History of Methodism* (2 vols., 1909), he published: *The Great Schoolmen of the Middle Ages* (1881); *Madagascar: Its Missionaries and Martyrs* (1892); *The Great Symbols* (1901; new ed., 1912); *History of Popular Education in England and Wales* (1903); *Robert Morrison* (new ed., 1904); *The Story of Methodist Union* (1906).

TOWNSEND'S WARBLER. A wood warbler (*Dendrœca townsendi*) of the Pacific coast of the United States, black and yellow in color (see Colored Plate of American Wood Warbler with the article Warbler) and having the general habits of its congeners. (See Warbler.) It is not numerous and lives in the mountain forests. This and several other birds of the West owe their names to the naturalist J. K. Townsend, who in 1834, in company with Thomas Nuttall (q.v.), traveled overland to the Pacific coast and brought to the notice of science many novel species of animals.

TOWNSHEND, toun'zend, Charles, second Viscount (1674–1738). An English statesman. A descendant of a very ancient English family of Norfolk, he succeeded to the peerage in 1687, was educated at Eton and King's College, Cambridge, and took his seat as a Tory in the House of Lords in 1697. He was named by the Godolphin administration one of the commissioners for arranging the union with Scotland (1706), was joint plenipotentiary with Marlborough at Gertruydenburg, and negotiated with the States-General in 1710 the Barrier Treaty, which pledged the States-General to the Hanoverian succession, and England to procure the Spanish Low Countries for the United Provinces, as a barrier against France. In 1712, upon the formation of the Harley ministry, Townshend was dismissed from his places, and the Barrier Treaty was censured by the House of Commons, which voted that Townshend and all who had been concerned in the treaty were enemies to the Queen and Kingdom. This persecution raised him from the rank of a follower to the station of a leader. He maintained a close correspondence with the court of Hanover and obtained the entire confidence of George I, who on his accession to the throne of England made Townshend Secretary of State with power to name his colleagues. He selected General, afterward Earl, Stanhope and formed a ministry entirely Whig in its party character. He strengthened it by the addition of his brother-in-law, Sir Robert Walpole, who, from being at first paymaster of the forces, was soon made Chancellor of the Exchequer and First Lord of the Treasury. Through misrepresentations on the part of his colleagues, Townshend lost favor with the King and was, in 1716, dismissed from office. After the breaking up of the South Sea Bubble and the death of Sunderland (q.v.) and of Stanhope, Townshend again (1721) became Secretary of State. But he was no longer the acknowledged leader of the Whigs. The superior talent of Walpole, his financial abilities, and his influence in the House of Commons caused a change in the relative position of the two ministers and converted the two men into rivals and enemies. Townshend, resigning the contest, retired to Rainham, to cultivate his paternal acres. "Never minister had cleaner hands," said Chesterfield; and his reputation for both private and public integrity remains unsullied.

TOWNSHEND, Charles (1725–67). An English politician. He was the second son of the third Viscount Townshend and was educated at Leyden and Oxford. He entered Parliament in 1747, attached himself to Lord Halifax, and was given a position in the Board of Trade in 1748. In 1754 Townshend was made Lord of the Admiralty, but resigned the following year. Becoming a member of the Privy Council under Pitt in 1757, upon the dissolution of the Whig government in 1761 he was won over by Bute with an offer of the post of Secretary for War. On Bute's resignation in 1763 he was appointed President of the Board of Trade. After opposing the Grenville administration he accepted the position of Chancellor of the Exchequer under Pitt in 1766. But Pitt soon lost control over his colleagues by his acceptance of the peerage and his long periods of illness, so that Townshend began to advocate measures to which Pitt was opposed. In 1767 his first budget was rejected, and he thereupon proposed those taxes on certain goods imported into America which was one of the chief causes of the Revolution. Townshend himself did not live to see this result, but died suddenly on Sept. 4, 1767. He was ranked as an orator with Pitt and was far more popular than the Great Commoner with the House of Commons. Consult P. H. Fitzgerald, *Charles Townshend: Wit and Statesman* (London, 1866), and Harry Graham, *Splendid Failures* (ib., 1913).

TOWNSHEND, Sir Charles James (1844–). A Canadian jurist. He was born at Amherst, Nova Scotia, and was educated at King's College, Windsor. Called to the bar in 1866, he practiced his profession at Amherst. He was a Conservative member of the Provincial Legislature in 1878–84, a member of the Provincial cabinet in 1878–82, and of the House of Commons in 1884–87. In 1887 he was appointed a puisne judge of the Supreme Court of Nova Scotia and in 1907–15 was Chief Justice of the Province. In 1911 he was knighted.

TOWNSHEND, Charles Vere Ferrers (1861–). A British soldier, commander in chief of the Mesopotamia campaign in the Great War. He entered the Royal Marines in 1881, but joined the army in 1886 and was promoted through the grades to major general in 1911. He served in the Sudan and Nile expeditions (1884–85) and in the Hunza Nagar expedition

(1891–92); commanded Chitral Fort during a siege; and participated in the Dongola expedition (1898) and in the South African War (1899–1900). Townshend was assistant adjutant general of the Ninth Division Army in India in 1907–09, and in 1912–13 commanded a division of the Territorial Force. During the European War (see War in Europe) he commanded the British army that withstood for nearly five months a Turkish siege at Kut el Amara in Mesopotamia, and was compelled to surrender in April, 1916, for lack of food.

TOWNSHEND, George, first Marquis (1724–1807). A British soldier. He served early in the Netherlands and at Culloden and Laufeld. While temporarily retired from the army he drafted the Militia Bill of 1757. In 1759, as brigadier general, he joined Wolfe's expedition against Quebec, commanded the left wing on the Heights of Abraham, and at Wolfe's death succeeded to the chief command. In 1764 he took the family title, Viscount Townshend. As Lord Lieutenant of Ireland in 1767–72 he was in continual dispute with the Irish House of Commons. He was made Marquis in 1786 and field marshal in 1796.

TOWNSHIP (AS. *tūnscipe*, from *tūn*, inclosure, town + *-scipe*, Eng. *-ship*). A minor political or territorial division in England and the United States. In England, in Anglo-Saxon times, as a political unit it was known as the tunscipe; as an ecclesiastical area it was the parish. As a political unit it had a popular assembly (tun moot); as an ecclesiastical unit it had a vestry meeting. The chief executive officer was the tun reeve. He with the priest and four other persons represented the township in the popular assembly of the hundred and county. Upon the settlement of the American Colonies the township was transplanted to America and still survives, like many other political institutions of English origin. Here it is a subdivision of the county, and its political importance varies with the locality of the State. In New England, under the name of the town, it plays a far more important part in the work of the local administration than the county—in fact, it performs most of the business of local government which in the Southern States is attended to by the county. (See Town.) In the Middle and Western States the township plays a somewhat less important part in the work of the local government than it does in New England, the county there sharing with the township many of the important functions of local government.

In the Southern States the township is not an administrative unit of much importance. On account of early social and political conditions there, the county has been from the first the chief unit of local government, although there are signs of development in the Southern township which may increase its administrative importance in the future. In some of the Middle and Western States the town meeting exists, having been transplanted from New England. Elsewhere the chief governing authority is a township board. The township has a quasi-corporate capacity, being able to own real estate and to sue and be sued, but in performing public governmental duties it acts for the State and cannot be held liable for the negligence or tortious acts of its agents. The word "township" is also applied to the units of the congressional survey in some of the Southern and Western States, these being rectangular areas 6 miles square, each of which is subdivided into 36 sections containing 640 acres. (See diagram under Surveying.) This is probably the most simple system of land division yet established. The congressional township, as it is sometimes called, is not a public corporation or juristic personality, but a geographical convenience. Consult Ashley, "The Anglo-Saxon Township," in *Quarterly Journal of Economics*, and Bryce, *American Commonwealth* (new ed., 2 vols., New York, 1910).

TOWNS'LEY, Clarence Page (1855–). An American soldier, born at Dekalb, St. Lawrence Co., N. Y. He graduated from the State Normal School at Potsdam, N. Y., in 1872, from Union College in 1876, and from the United States Military Academy in 1881. Entering the artillery service, he was promoted captain in 1899 and colonel in 1911. During the Spanish-American War he served on the staff of General Ludlow, who was chief of artillery and chief ordnance officer of the Department of Havana, Cuba. In 1909–11 he was commandant of the Coast Artillery School at Fort Monroe and in 1912–16 was superintendent of the United States Military Academy (West Point).

TOWNS'VILLE. A fortified seaport on the east coast of Queensland, Australia, situated on Cleveland Bay at the mouth of Ross Creek, 870 miles northwest of Brisbane (Map: Queensland, E 5). It has a cathedral, courthouse, technical school, barracks, etc. Its industrial establishments include foundries, distilleries, and meat-exporting establishments. It is the terminus of the railway from Winton, 365 miles inland, and has an extensive shipping trade; the harbor is tidal and has been much improved by two long breakwaters, large vessels being enabled to enter. Pop., 1901, 12,717; 1911, 13,835.

TOWSE, J(ohn) Ranken (1845–). An American dramatic critic. He was born at Streatham, Surrey, England, and was educated at Cambridge. Coming to the United States in 1869, he joined the staff of the New York *Evening Post* the next year and after 1874 was its dramatic critic. To this paper he contributed notable articles on all the most important theatrical productions. Some of his criticisms appeared also in the *Nation*. In the Saturday supplement of the *Post* were published his *Sixty Years of the Theatre: An Old Critic's Memories* (1913–14; part ii, 1915–16).

TOW'TON. A parish in Yorkshire, England, about 11 miles southwest of York, noted as the scene of a decisive victory gained by the Yorkist forces under Edward IV and the Earl of Warwick over the Lancastrians, commanded by the Duke of Somerset and the Earl of Northumberland, March 29, 1461. The battle is said to have been the most sanguinary ever fought on English soil, and according to a contemporary statement 28,000 men were left dead upon the field. The victory secured Edward IV (q.v.) in possession of the throne. See Roses, Wars of the.

TOXÆ'MIA. A poisoned condition of the blood due to the circulating in it of toxic materials, either chemical or bacterial in their nature. These toxins may be derived from putrefactive or other fermentative changes in the intestinal tract or from the products of bacterial activity in the tissues circulating the blood. When bacteria themselves find entrance into the blood stream, the condition is known as bacteræmia. See Autointoxication; Immunity; Toxin; Vaccine Therapy.

TOX'ICOL'OGY (from Gk. *τοξικόν*, *toxikon*, poison, neut. sing. of *τοξικός*, *toxikos*, relating to the bow, from *τόξον*, *toxon*, bow, so called because first used to poison arrow points + *-λογία*, *-logia*, account). The branch of medical science which treats of the nature of poisons, their morbific effects on the animal system, their detection in the organs or tissues of the body, their antidotes, of the treatment of poisoning, and of the legal questions connected with poisoning. A poison may be defined as any substance which when applied to the body or introduced into the system, in whatever manner, produces death or serious bodily harm. Poisons may enter by the mouth or may be absorbed by the skin in amounts sufficient to cause death or severe toxic symptoms, as from lotions or salves containing opium, corrosive sublimate, arsenic, carbolic acid, etc. Gaseous or volatile poisons may enter the lungs through inspired air, e.g., illuminating gas, carbon monoxide, or chlorine. Poisons may gain access to the circulation through ulcerated surfaces or wounds; by direct injection into the tissues, as by hypodermic injection, poisoned weapons, or snakebites; or they may be introduced by way of the mucous membrane of the rectum, vagina, urethra, etc.

Most medicinal agents are poisonous if taken in sufficient quantity, this quantity varying with the individual, the state of health, fullness or emptiness of the stomach, habit, and other circumstances. The influence of habit is shown by opium habitués who take enormous doses of the drug without immediate evil effects. A special susceptibility to certain substances is noted in some individuals. This is called idiosyncrasy. Idiosyncrasy towards certain articles of food or towards foreign proteins such as egg albumen, serums, etc., when injected, is now looked upon as a phase of anaphylaxis (q.v.). Races and individuals may possess or attain a high degree of immunity to particular poisons—the Oriental is much less susceptible to opium than the European, and the latter bears alcohol better than savage races. In certain diseases there is a diminished susceptibility to the action of particular poisons, while in others there is increased sensibility. Thus, in tetanus, hydrophobia, mania, or delirium tremens doses of various sedatives may be given with benefit which would in health prove fatal; on the other hand, when there is a predisposition to apoplexy, an ordinary dose of opium may cause death. Some poisons are harmless to the stomach, but violently toxic when injected beneath the skin.

Poisons may be classified according to their chemical properties or their physiological action. The latter is the usual and most satisfactory basis and depends upon the effects of poisons upon the system when in healthy condition. According to the physiological classification poisons are divided into two great groups: (1) the irritants and (2) the neurotics. An irritant poison is one which when swallowed produces irritating effects upon the mucous membrane of the alimentary canal, resulting in nausea, vomiting, purging, pain in the abdomen, cramps in the stomach and other parts of the body. This group is subdivided into (*a*) corrosives, whose action is chiefly local, and (*b*) the true irritants, whose local effects may be slight, but which produce their characteristic effect after absorption. Many drugs act in both ways, e.g., oxalic acid and carbolic acid. A neurotic poison is one which acts chiefly on the nervous system, producing drowsiness, giddiness, headache, delirium, stupor, coma, convulsions, or paralysis.

A few principles of the general treatment of poisoning may be given. The indications are (1) to neutralize and render harmless the poison by the administration of the proper antidote (q.v.); (2) to remove the poison from the body by inducing vomiting or washing out the stomach; (3) to combat the effects of poison already absorbed by giving drugs which are antagonistic to the one absorbed and supporting life until the body rids itself of the poison through natural excretory channels. Mechanical antidotes include the use of the stomach tube or pump, the employment of emetics, cathartics, stimulants, injections, ligations, etc. The true or chemical antidotes include albumin, milk, charcoal, soap, starch, oils, tannin, turpentine, acids, alkalies, potassium permanganate, sodium chloride, iodine, iron, etc.

When a poison has been taken by the mouth the stomach should be emptied immediately by means of the stomach tube or emetics, except where there is severe corrosion and perforation of the stomach is feared. A prompt and certain emetic is apomorphine, which will act when given hypodermically. Domestic resources are usually limited to large drafts of mustard and warm water, warm milk in large quantities, oils, butter, and lard, common salt solution, soapsuds; these often act with great promptness. Ipecac in the form of the sirup is found in most households and may be given in doses of one or two tablespoonfuls to adults or half that to children. It is safe and unirritating, but is too slow for emergencies. Other useful emetics are copper sulphate, zinc sulphate, turpeth mineral, and alum. In poisoning it is better to use almost any emetic at once than to lose valuable time getting the right one. When poisoning is due to irritants after evacuation of the stomach, bland and viscid fluids should be given to protect the wall of the alimentary tract and allay inflammation. These agents are called demulcents—flaxseed tea, white of egg, milk, etc. Where the poison has gained entrance by inoculation, as in the case of dogbites or the stings of reptiles, the part should be washed, sucked, or incised freely, and a ligature applied about the extremity above the wound, i.e., between it and the heart. The wound should then be thoroughly cauterized.

The stomach having been emptied, the next step is to administer the proper antidote or physiological antagonist. In general it is to be remembered that alkalies counteract acids and vice versa, since they tend to form harmless salts. Poisoning by the irritant metallic salts is best treated with albumin, in the form of white of egg, an inert, insoluble albuminate being formed. The antidote for the vegetable alkaloids is tannin, most conveniently given in the form of strong green tea. Chemical antidotes act only on such portions of the poison as have not been absorbed and must be given promptly.

Physiological antidotes or antagonists follow the poison into the circulation and combat its effects as long as it remains in the body.

Corrosive Poisons include acetic, carbolic, chromic, lactic, oxalic, and salicylic acids; concentrated mineral acids (sulphuric, nitric, etc.); creosote; corrosive sublimate, the caustic alkalies (potassium and sodium dioxide, usually in the form of lye, ammonia, etc.); quicklime; potassium chlorate; and potassium nitrate. These poisons act either on the surface of the body, causing deep and painful destruction of tissue, or internally, by producing intense gastroenteritis and collapse. The symptoms common to the group are nausea, vomiting, pain, and purging, the vomited and dejected matters being mucous, serous, or bloody. The mouth and lips, hands and face, are frequently burned and corroded. Treatment consists in neutralizing the poison and giving demulcents. In the case of weak acids, magnesia, chalk, soap, and dilute ammonia may be given as antidotes; for alkaline poisoning weak acids, such as dilute vinegar or lemon juice, may be given. When the poison is concentrated the stomach tube should not be used. Carbolic acid is best antidoted with dilute alcohol. The sulphate of magnesia is also a perfect antidote.

True Irritants include, besides certain of the corrosive poisons already mentioned, bromine, blister beetle, croton oil, chlorine, antimony, arsenic, copper, chromium, lead, tin, zinc, phosphorus, and iodine (qq.v.). In concentrated form most of them cause irritation to the gastrointestinal tract, and also show specific action on various organs after their absorption by the blood. Arsenic is commonly employed, or taken accidentally, with homicidal or suicidal intent. It is widely used in the arts and is a constituent of vermin exterminators. Poisoning may be acute or chronic. In acute cases the symptoms are those common to irritant poisons. The chemical antidote is known as arsenic antidote, or dialyzed iron. A small dose of arsenic (1 to 3 grains) is sufficient to kill. Chronic poisoning by arsenic is also common as a result of inhalation or contact with the various arsenical greens used in coloring wall papers, carpets, etc., grinding arsenic in mills, and from vapors in smelting copper. Symptoms are gastric irritation, cough, throat troubles, gradually failing health, and paralysis. See ARSENIC.

Lead poisoning may also be acute or chronic, the latter being the most usual form. Acute cases are due to the ingestion of the acetate (sugar of lead), carbonate, oxide, or chromate of lead, and painters are the chief sufferers. The prominent symptoms are gastrointestinal irritation, cramps in the legs and abdomen, followed by paralysis of the extremities, convulsions, and coma. The sulphate of magnesia (Epsom salt) is the antidote, forming an insoluble sulphate of lead and acting also as a purge. Chronic poisoning arises from handling paints, drinking water conducted in lead pipes, the use of cosmetics containing lead, and eating canned foods contaminated by solder. It is an incident of many different trades. (See OCCUPATIONAL DISEASES.) The symptoms come on insidiously and consist of a peculiar griping colic (lead colic), obstinate constipation, muscular cramps, paralysis of the extensor muscles of the forearms (wrist-drop), and a blue line at the junction of the gums and teeth. Chronic poisoning is treated by removing its source and by the administration of Epsom salt and potassium iodide to eliminate the lead already absorbed. See LEAD.

Phosphorus poisoning is due to yellow phosphorus, commonly derived from matches or rat poisons. Workers in match factories are most usually attacked, although rat poison is sometimes taken with suicidal intent. The poison is very active and recovery is rare. The prominent symptoms in acute poisoning are vomiting of matters luminous in the dark, a smell of phosphorus in the breath, inflammation of the stomach and intestines, jaundice, convulsions, and coma. Treatment consists in washing out the stomach and the administration of old oil of turpentine or potassium permanganate.

Poisonous Foods. Many foods which, owing either to their inherent properties (mushrooms and other fungi) or to the development of putrefactive bodies within them (ptomaines), produce symptoms of poisoning when eaten. The symptoms are very diverse, but intense gastrointestinal irritation is common to all of them, and they may therefore be appropriately classed as irritants. Mushroom poisoning arises through mistaking various fungi, such as mushrooms, toadstools, and truffles, for edible varieties. The toxic substance in many of these is muscarine, a deadly alkaloidal poison, producing violent vomiting, colic, thirst, dyspnœa, paralysis, and death. Ptomaine poisoning is due to the products of putrefactive decomposition in animal or vegetable matter. The ptomaines are alkaloids and resemble chemically many of the vegetable alkaloids. Not all ptomaines are poisonous and not all food poisons are ptomaines. The foods which sometimes produce symptoms of poisoning, whether ptomaine or other, are corned beef, sausage, pickled or decaying fish, putrid game, cheese, milk, shellfish, particularly mussels and crayfish, land crab, etc. The treatment of food poisoning, from whatever cause, is prompt evacuation of the stomach, preferably by stomach tube, using plenty of water, and administration of tannic or gallic acid or strong tea. See MUSHROOM; PTOMAINES.

Neurotic Poisons. These act principally through the nervous system and as a rule produce little or no tissue change.

Alcohol may act as an acute or chronic poison. Its effects are fully considered under INTOXICATION.

Opium and its chief alkaloid (morphine) laudanum, Majendie's solution (of morphine), and paregoric are often used for suicidal or homicidal purposes. Paregoric was formerly responsible for many cases of opium poisoning in children, being a common ingredient of soothing sirups. Acute opium poisoning is characterized by a short preliminary stage of pleasurable excitement followed by drowsiness, sleep, and complete unconsciousness. In a moderately advanced case the pupils are contracted to a pin point, the respirations are slow, the pulse full, the skin moist. The breathing grows slower until death supervenes from respiratory paralysis. The stomach must be promptly emptied and tannic acid or potassium permanganate given as antidote. Stupor is combated by administration of strong coffee, atropine, or strychnine, and by cold douches, flicking with wet towels, electrical stimulation, and later by forced artificial respiration. Chronic opium poisoning is seen in those habituated to the drug, both in eastern and western countries. See MORPHINE; OPIUM.

Cocaine is extensively used as a local anæsthetic, and alarming symptoms have followed its absorption by the mucous membrane or its hypodermic injection. Death occurs very rapidly (from 40 seconds to four minutes), with great depression and respiratory or cardiac failure. If the patient can be kept alive for half an hour, recovery is almost certain. If the poison has been taken by the mouth, evacuate the stomach, and in any case fresh air, artificial respiration, and stimulants are called for. See COCAINE.

Chloral is quite often injudiciously used by the public to induce sleep and quiet the nerves; it is also taken with suicidal intent and given by criminals (knock-out drops) to induce prolonged stupor, often with fatal results. The patient simply passes into a deep sleep without previous excitement, and death occurs from heart failure. Treatment is like that of opium and cocaine. See CHLORAL.

Belladonna and its alkaloid atropine produce, when taken in poisonous amounts, dilatation of the pupil, flushing of the skin, dryness of the mouth, delirium, and sometimes convulsions. Recovery is the rule, but when death occurs it is from paralysis of the heart. Treatment consists in washing out the stomach, and opium is the physiological antidote. Similar in effects and treatment to belladonna are homatropine, hyoscyamus (henbane), hyoscyamine, hyoscine, stramonium, and dulcamara. See ATROPINE; BELLADONNA.

Strychnine and nux vomica are contained in certain vermin killers and used both for suicide and murder. In poisonous doses they act principally on the spinal cord, producing cramps and convulsions like those of tetanus. Death or recovery is usually speedy. The patient is to be put in a quiet dark room, and tannic acid or charcoal is given, followed by stomach washing. This must be done before spasms set in. Chloroform and ether control the convulsions, and the bromides and opium act in the same way, but more slowly. See STRYCHNINE; TETANUS.

Prussic acid and the various cyanogen compounds contained in cyanide of potash, bitter almonds, peach and plum pits, are exceedingly rapid and fatal poisons. When smaller doses have been taken sulphate of iron may be given as an antidote, and affusions and douches of cold water and a resort to artificial respiration are the most useful measures. See HYDROCYANIC ACID.

Among other substances in the class which are occasionally taken in poisonous doses are aconite, cannabis indica, curare (arrow poison), digitalis, hemlock, and the various coal-tar products, such as acetanilid, phenacetine, and sulphonal (qq.v.).

Anæsthetics (ether, chloroform, and nitrous oxide) act as narcotic poisons when taken in overdose. The symptoms may be divided into two stages—one of excitement with rapid pulse and respiration, struggling and flushed face; and one of depression, in which the muscles are relaxed, the patient is insensible, passes into coma, and dies from cardiac or respiratory failure. When dangerous symptoms come on during the administration of an anæsthetic, this is to be stopped, the tongue drawn forward, the patient exposed to a current of fresh air, and if breathing stops subjected to artificial respiration. Hypodermic injections of atropine or strychnine are also given. The inhalation or drinking of ether and chloroform is indulged in as a habit by a few individuals. See ANÆSTHETIC.

Gaseous Poisons. The more common of these are carbonic-acid gas, carbon monoxide, hydrogen sulphide, sulphurous oxide, illuminating gas, sewer gas, and cesspool emanations, and carbonic-acid gas (choke damp) as found in the air of mines, cellars, and wells. Miners are frequently killed by the latter. Carbon monoxide occurs in charcoal fumes, fuel gas, and illuminating gas and passes into the air of a room from defective flues or pipes. Air containing 1 per cent of this gas is rapidly fatal. When exposure to this poison has been long and unconsciousness exists, recovery is not probable. The effects of illuminating gas are similar to those of carbonic oxide. Sewer gas is a mixture of sulphureted hydrogen, ammonium sulphide, nitrogen, and carbonic-acid gas. The symptoms of the gaseous poisons depend on the amount absorbed and vary from slight headache and dizziness to suffocation and collapse. The treatment is to get the patient into the fresh air, give oxygen, or perform artificial respiration, use the pulmotor, and stimulate. See PULMOTOR.

Animal Poisons. The stings of insects, the bites of scorpions, tarantulas, snakes, and rabid dogs are comprised in this group. Their action is complicated. The local effects are irritation, redness, swelling, and œdema, or even gangrene. The poison after entering the circulation may disorganize the blood, causing jaundice, hæmoglobinuria, hemorrhage into the tissues, and cyanosis. There are in addition general symptoms, such as vertigo, dyspnœa, prostration, cardiac paralysis, and finally collapse. Local treatment of such bites consists in the application of a tight band or ligature above the wound to prevent absorption; the destruction by the knife or cautery of the area containing the poison after removing as much as possible by suction; and the administration of stimulants such as ammonia, alcohol, or strychnine, to keep up the strength until the poison is eliminated. A serum known as antivenene has been employed as treatment in bites of poisonous snakes with doubtful results. See GLANDERS; HYDROPHOBIA; SERUM THERAPY.

The medicolegal duties of the medical examiner in cases of fatal poisoning, whether suicidal or homicidal, are: (1) to establish the presence or absence of conditions characteristic of any poison; (2) to preserve all necessary material for subsequent analytical examination and to avoid introducing possible causes of error; (3) to recognize or exclude natural causes of death; (4) to perform experiments on animals, if necessary, in order to demonstrate the toxic effect of the substance separated by the chemical; and (5) to record carefully all observations and state clearly the conclusions as to the cause of death. Difficult cases constantly arise in which the post-mortem appearances are not decisive or are consistent with either disease or poison. In performing an autopsy for medicolegal purposes the identity of the body must first be established and the autopsy should be done in the presence of witnesses. The organs and tissues to be removed and preserved for future analysis are deposited separately in clear glass jars, which are sealed. The tissues and organs to be removed are the stomach, and intestines ligated and unopened, the entire liver, the blood from the heart and vessels, both kidneys, the urine, the entire brain, a large piece of muscle from the thigh, and portions of the bone and spleen. Important information as to the time of absorption is evidenced by the distribution of poison in the various tissues. The unabsorbed residue is found in the stomach and intestines. Poisons in both stomach and liver indicate a short interval between the taking and death, while poison in the liver and other organs, with none in the stomach, indicates a greater interval. Most poisons remain in the liver after disappearing from the stomach and remain longer in the muscles and bones than in any other tissue. Poisons are found in their greatest purity in the kidneys and urine. Proof of poisoning has been established by chemists by analysis of muscles or one kidney, when all the other tissues have been destroyed by the suspected parties. Besides the examination for poisons and their lesions, every organ must be examined for all natural causes of death, and in particular the causes of sudden death should be rigidly excluded. Consult: Witthaus and Becker, *Medical Jurisprudence, Forensic Medicine, and Toxicology* (New York, 1894); J. J. Reese, *Medical Jurisprudence and Toxicology* (8th ed., Philadelphia, 1911); W. R. Smith, *Medical Jurisprudence* (London, 1913); W. Autenrieth, *Laboratory Manual for the Detection of Poisons and Powerful Drugs* (Philadelphia, 1915); A. H. Brundage, *Manual of Toxicology* (8th ed., New York, 1915). See Alkaloids; Autopsy; Death; Medical Jurisprudence; Occupational Diseases.

TOX′IN. Toxins are specific poisonous substances elaborated by the metabolic activities of certain microörganisms. A few varieties of bacteria secrete their toxins directly into the tissues or culture media in which they grow and are known as soluble, exogenous, extracellular, or true toxins. Other bacteria retain most of the poisonous material within themselves and hence are known as intracellular or endotoxins, these being liberated only when the bacteria become disintegrated by chemical, physical, or mechanical means. Besides bacterial toxins there are characteristic poisons produced by various plants and animals and termed respectively phytotoxins and zoötoxins. The more important true toxins causing infection in man are those of diphtheria, tetanus, botulism, dysentery, staphylolysin, and other bacterial toxins. Owing to their extreme susceptibility to various chemical and physical influences, such as light, heat, age, etc., toxins are difficult to isolate in their pure state. Oxidizing agents destroy them, and our knowledge of them has been gained chiefly through the lesions and symptoms which they produce when injected into susceptible animals. They are all poisonous, but in order to become effective must enter into chemical combination with the animal cells. They are, with the exception of botulin, destroyed by the gastrointestinal juices. While their exact chemical nature is unknown, it is the general belief that they are toxalbumins and closely allied to proteins. It has also been abundantly demonstrated that they are colloid in nature and bear a close resemblance to enzymes. They differ from ptomaines in that they are absolutely specific synthetic products, whereas ptomaines are cleavage products from the medium upon which the bacteria grow. Toxins, moreover, can give rise to antibodies, whereas ptomaines cannot produce them. See Antitoxin; Bacteria; Diphtheria; Immunity; Serum Therapy.

TOXODONTIA, tŏk′sô-dŏn′shĭ-ȧ (Neo-Lat. nom. pl., from Gk. *τόξον*, *toxon*, bow + *ὀδούς*, *odous*, tooth). An extinct suborder of ungulate mammals found fossil in the Tertiary deposits of Argentina and Patagonia, South America. *Toxodon* was a heavily built animal as large as a rhinoceros, with a large heavy head placed on a short neck which sloped down from the shoulders, so that the head was much lower than the back. The teeth are large, compressed laterally, and either triangular or prismatic in section, and they grew from persistent pulps. The bones of the skeleton are all massive, the legs short and thick, and the feet are three-toed. *Nesodon*, an earlier genus than *Toxodon*, was of smaller size and less robust build.

TOXOPH′ILUS. A work in two books on archery by Roger Ascham (q.v.), in the form of conversations between Philologus and Toxophilus on the attractions of books and archery (q.v.).

TOXOPHYLAX′INS. See Immunity.

TOX′OSO′ZINS. See Immunity.

TOY, Crawford Howell (1836–). An American Orientalist. He was born in Norfolk, Va., and graduated at the University of Virginia in 1856. He studied at Berlin in 1866–68, became professor of Hebrew at the Southern Baptist Theological Seminary in 1869, and in 1880 was called to Harvard, where he served as Hancock professor of Hebrew and other Oriental languages till his retirement in 1909, and also as Dexter lecturer on biblical literature till 1903. In 1879 he served as president of the American Philological Association. His publications include a translation and revision of Erdmann's commentary on Samuel in Lange's series (1877); an edition of Murray's *Origin of the Psalms* (1880); *The Religion of Israel* (1882; 3d ed., 1884); *Quotations from the Old Testament in the New Testament* (1884); *Judaism and Christianity* (1890); the Book of Ezekiel in the *Polychrome Bible* (Hebrew text, 1896; English, 1898); Proverbs, in the *International Critical Commentary* (1899); *Introduction to the History of Religions* (1913).

TOYAMA, tō′yä′mȧ. The capital of the Prefecture of Toyama in Japan, situated in the central part of Hondo, near the west coast (Map: Japan, E 5). The old castle is used as a school. There are manufactures of leather. Pop., 1908, 57,437.

TOYN′BEE, Arnold (1852–83). A pioneer of the Social Settlement movement. He was educated at Balliol College, Oxford, and afterward became a tutor and lecturer there. He was the author of a number of well-known addresses on political economy, but is best known by his efforts to understand the economic and social problems of the working classes of Whitechapel, among whom he made his home, associating himself with the religious work carried on there by his friend S. A. Barnett. Early in life Toynbee had come under the influence of Ruskin, but his sympathy with the artisan class found a means of expression entirely his own. His favorite maxim, "The welfare of the producer is as much a matter of interest to the consumer as the price of the product," voiced the religion of the student of social conditions. His name is associated with the modern Social Settlement (q.v.). Two years after his death in the crowded Whitechapel district, which had been the scene of his efforts, Toynbee Hall was erected by the men of Oxford and Cambridge who had shared his labors there. Consult F. C. Montague, *Arnold Toynbee* (Baltimore, 1889), and A. Milner, *Arnold Toynbee* (3d ed., New York, 1901).

TOYNBEE, Paget (1855–). An English scholar, especially known for his studies in Dante. A brother of Arnold Toynbee, he was born at Wimbledon, near London, attended Haileybury College, Hertfordshire, and Balliol College, Oxford, and was a private tutor (1878–92). He published: *Specimens of Old French* (ninth to fifteenth century) (1892); *Historical French Grammar,* which is a skillful revision and amplification of Brachet (1896); *Ricerche e Note Dantesche* (1899; 2d series, 1904); *Critical Text of the "Divina Commedia"* (1899); *Life of Dante* (1900; 4th ed., enlarged, 1910; Ital. trans., 1908); *Dante Studies and Researches* (1902); *Dante in English Literature, from Chaucer to Cary* (2 vols., 1909); *A Concise Dictionary of Proper Names and Notable Matters in the Works of Dante* (1914); *The Correspondence of Gray, Walpole, West, and Ashton* (1915).

TOYNBEE HALL. The first social settlement in the world, founded in 1884 by Canon Samuel A. Barnett, vicar of St. Jude's, Whitechapel, East London. It was named in honor of Arnold Toynbee (q.v.), who while a student at Oxford became interested in bettering the condition of the poor in the Whitechapel district. In 1877 Canon Barnett formed at Oxford a committee to consider university extension, as a result of which various lectures were given in Whitechapel. In 1884 the University Settlement Association was formed and Toynbee Hall was opened.

A basic principle in the minds of its founders was that constructive action for the alleviation of the condition of the poor required that practical experience of their problems to be gained only by intimate association. The plan provided that young university men, unencumbered with family affairs, should live as residents at the hall and devote some of their free time to the problems of the community. About the residents was grouped a body of "associates," about 100 in number, who lived near and coöperated. Moreover "guest rooms" at the hall afforded temporary quarters for graduates and undergraduates who desired to spend short periods there assisting and learning. Toynbee Hall gradually became the centre of educational and social endeavor for the district. Its activities have broadened and its influence deepened. It has libraries, lecture courses, reading clubs, technical classes, musical societies, numerous educational activities, workingmen's clubs, and is an active factor in local government. Consult: Philip L. Gell, *Account of the Work of Toynbee Hall in East London,* in Johns Hopkins University Studies (Baltimore, 1889); Canon S. A. Barnett and Mrs. S. A. Barnett, *Practicable Socialism* (London, 1915).

TOYOHASHI, tō'yō-hä'shē. A town in the Prefecture of Aichi, central Hondo, Japan, 45 miles by rail southeast of Nagoya (Map: Japan, E 6). Pop., 1898, 21,785; 1908, 43,980.

TO'ZER, Henry Fanshawe (1829–). An English writer, teacher, and traveler. After graduating from Exeter College, Oxford, in 1850, he was tutor there from 1855 to 1893 and was also curator of the Taylor Institution (Oxford) from 1869 to 1893. He traveled much in Greece and in European and Asiatic Turkey, and, besides editing various works, published: *The Highlands of Turkey* (2 vols., 1869); *Lectures on the Geography of Greece* (1873); *Primer of Classical Geography* (1877); *Turkish Armenia and Eastern Asia Minor* (1881); *The Church and the Eastern Empire* (1888); *The Islands of the Ægean* (1890); *History of Ancient Geography* (1897); *An English Commentary on Dante's Divina Commedia* (1901), and a translation of the *Divina Commedia* (1904).

TRABERT, tră'bĕrt, Wilhelm (1863–). An Austrian meteorologist, born in Frankenberg, Hesse. He took his Ph.D. in 1888 at Vienna University, where he became associate professor in 1901. The next year he was appointed to the chair of cosmical physics at Innsbruck and later to the directorship of the Central Bureau of Meteorology at Vienna. He became a member of the International Polar Commission. Trabert published: *Meteorologie* (1896; 2d ed., 1901); *Meteorologie und Klimatologie* (1905); *Lehrbuch der Kosmischen Physik* (1911).

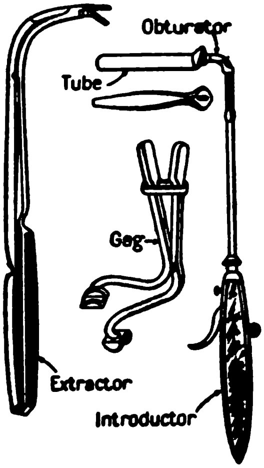
TRA'CERY (from *trace,* OF. *tracer, trasser,* Fr. *tracer,* to trace, track, delineate, from ML. **tractiare,* frequentative of Lat. *trahere,* to draw, drag). The decorative subdivision of a window, arch, or other opening into smaller parts by means of mullions, cusps, and foils, perforated stonework, etc.; but the term is not applied to such perforated slabs as fill many Oriental and some Romanesque windows. Tracery was developed during the Gothic period chiefly in France and England from its germ in two openings grouped under an arch with a decorative opening pierced in the spandrel above them. This early phase, called plate tracery, is seen in the early rose windows of Chartres (1170) and in English churches of the twelfth century. The openings were multiplied and in later examples replaced by slender mullions, arches, circles, cusps, and foils of stone (bar tracery). The general frame of each window inclosed several separate lights, and above and between their arched summits were minor foiled openings. These became more elaborate in the succeeding centuries, seeking ever more complex geometric combinations of lines. The rose or wheel windows, such as those of Notre Dame in Paris, and the clerestory and chapel windows of the cathedrals of Rheims and Amiens, illustrate the various stages of this development. This tracery spread gradually from the windows until it overran almost every part of the church with its delicate lace patterns, sometimes on a solid ground (wall tracery), sometimes pierced. The period of a Gothic structure can generally be judged with tolerable accuracy by the style of its tracery. This is particularly the case in England, where two of the three main divisions of the Gothic movement, the Decorated and the Perpendicular, are so called on account of their distinctive styles of tracery. During the Decorated (q.v.) period the tracery, at first composed of simple arches, circles, and cusps (geometric), later assumed freer curved lines (curvilinear or flowing). About 1375 there is an almost abrupt transition to the Perpendicular (q.v.) tracery, in which vertical mullions dominate the design. The English tracery, especially in the vast east and west windows, is on the whole richer and more varied than the French. The finest French examples are the great rose windows of the west fronts and especially the transepts of the great cathedrals (whence the term Rayonnant). The Flamboyant (q.v.) style in France, contemporary with the English Perpendicular, had tracery of a very different description, composed of swaying and flowing lines, an elaboration of the English curvilinear type. German tracery followed in the main, but with variations, the French types (e.g., Strassburg, Freiburg). With a few exceptions Italian tracery is negligible, as large windows were not in favor. See GOTHIC ART; WINDOW.

TRACHEA, trā′kē-ȧ (Neo-Lat., from Lat. *trachia*, from Gk. *τραχεῖα*, *tracheia*, trachea, windpipe, rough artery, so called because of the rings of gristle, from *τραχύς*, *trachys*, rough), or WINDPIPE. The tube through which air-breathing vertebrates receive air into the lungs. It extends from the throat to the bifurcation of the bronchi. It is sufficiently described under RESPIRATION. Tracheotomy (q.v.), or the more modern practice of bronchoscopy, is necessary for the removal of foreign bodies lodged in the trachea and bronchi. The trachea shares certain inflammations and morbid processes in common with the larynx and the bronchi. For figure of trachea, see BRONCHUS.

TRACHE′Æ. The characteristic elements of woody tissue. See TRACHEID.

TRACHEID, trā′kē-ĭd. A cell of the woody tissue in which the wall is thickened (lignified), but with thin areas of various forms left, resulting in different patterns of wall sculpture. Tracheids are single cells as distinguished from tracheæ (q.v.), which are cell fusions. Tracheids are characteristic of the secondary wood of gymnosperms, while tracheæ make up the wood of angiosperms. See HISTOLOGY.

TRA′CHEOT′OMY (from Gk. *τραχεῖα*, *tracheia*, trachea, windpipe, rough artery + *τομή*, *tomē*, a cutting, from *τέμνειν*, *temnein*, to cut) and LARYNGOTOMY (from Gk. *λάρυγξ*, *larynx*, larynx + *τομή*, *tomē*, a cutting). Opening the trachea by incision in order to admit the entrance of air when suffocation is threatened. Among the conditions which demand tracheotomy are foreign bodies in the air passages, cut throat, diphtheria, œdema of the glottis, and tumors either within the larynx or pressing upon the air passages from without (as a goitre). The air passages may be opened in three different situations, viz., through the crico-thyroid membrane (see LARYNX), when the operation is termed laryngotomy; through the cricoid cartilage and the upper rings of the trachea, the operation being known as laryngotracheotomy; and through the trachea, below the isthmus of the thyroid gland, constituting tracheotomy proper.



INSTRUMENTS FOR INTUBATION.

The incision is made in the middle line of the neck, longitudinally, the blood vessels being pushed aside as much as possible with the handle of the knife. When the trachea is exposed and is cut through, the wound is held apart with tenacula that the tube may be inserted. When the operation is completed a large curved tube to breathe through is inserted in the aperture and secured round the neck with tapes.

A double tube or cannula possesses many advantages, as by withdrawing the inner one, which should slightly project at its lower extremity, it may be cleared of any mucus or blood that may have accumulated in it, without disturbing the wound. The calibre of the inner tube should always be sufficiently large to admit as much air as usually passes through the chink of the healthy glottis. Up to the time of O'Dwyer (q.v.) the operation of tracheotomy was frequently and successfully performed. In 1885 Dr. Joseph O'Dwyer, of New York, devised instruments wherewith intubation of the larynx was performed as a substitute for tracheotomy, especially in laryngeal diphtheria. Intubation consists in placing a short tube in position in the larynx, between the vocal cords, its lower end reaching a point as low as an incision would be made if the air passages were opened and thus admitting air from the throat. The recoveries from diphtheria in cases in which intubation is practical average over 50 per cent. The necessity for tracheotomy has further been reduced by the introduction of electrically lighted tubes (laryngoscopes, bronchoscopes), through which polypoid or fungous growths in the larynx and foreign bodies in even the smaller bronchial tubes can be seen and removed with special forceps.

TRACHINIÆ, trā-kĭn′ĭ-ē (Lat. nom. pl., from Gk. Τραχίνιαι, women of Trachis). A tragedy by Sophocles describing the death of Hercules, caused by the poisoned coat of Nessus, sent to him by Deianira in jealousy of the captured Iole. The play takes its name from the chorus composed of women of Trachis, where Deianira is awaiting the return of her husband.

TRACHOMA, trȧ-kō′mȧ. A disease of the conjunctiva. See CONJUNCTIVITIS, *Granular Conjunctivitis*.

TRACHYTE, trā′kīt *or* trăk′īt (from Gk. *τραχύτης*, *trachytēs*, roughness, from *τραχύς*, *trachys*, rough). The name given to certain volcanic rocks which are composed essentially of alkali feldspar, having no quartz, but a small proportion of either biotite, hornblende, or augite. It agrees thus with syenite in mineral constitution, although it differs from the latter in its finer texture, indicative of rapid cooling at or near the surface. The presence of small cavities often gives the rock a rough feel; hence the name.

TRACK, RAILWAY. See RAILWAYS.

TRACK ATHLETICS. See FIELD SPORTS.

TRACKER ACTION. See ORGAN.

TRACT. See GRADUAL.

TRACTA′RIANS. A popular name given, in the early days of the Oxford movement (q.v.), to the party led by Newman, Pusey, and Keble, from the *Tracts for the Times*, written by these and other members of the party.

TRACTION ENGINE. See AUTOMOBILE.

TRACT SOCIETIES (Lat. *tractus*, treatment, discussion, handling, drawing, from *trahere*, to draw, drag). The word "tract" signifies a brief treatise. In the modern use of the term it is applied almost exclusively to treatises upon religious subjects, and a tract is distinguished from a book mainly by its external (pamphlet) form and its brevity. The earliest illustration of a tract is found in the separate books of the Bible, each one of which, as originally circulated in manuscript form from hand to hand, may be considered a tract. Apart from this, however, we may consider Wiclif, the great English reformer, as the first to begin the work of writing and distributing tracts, which, though laboriously produced by hand, yet obtained a large circulation. With the invention of printing the possibilities for the development of tract literature were wonderfully enlarged, and the religious movement which culminated in the Reformation may be said to mark the commencement of the general dissemination of Christian literature in tract form.

The availability of tracts as a means for propagating Christian knowledge led to the formation of societies for that express purpose. An early pioneer among tract societies for English-speaking peoples was the Society for Promoting Christian Knowledge, which was organized in England in 1698 and incorporated in 1701 to circulate Bibles and religious tracts both at home and abroad. The publication of tracts, begun by John Wesley in 1742, was soon carried forward upon a large scale, and in 1728 he organized the Society for the Distribution of Tracts among the Poor. The first interdenominational union of Christian effort for the circulation of tract literature was effected in 1750, in the city of London, by the formation of the Society for Promoting Religious Knowledge among the Poor. This was followed by the organization of similar societies in other cities, and, though none of these maintained a permanent existence, they must be regarded as forerunners of the great tract societies of modern times. In the closing decade of the eighteenth century, at Bath, England, Hannah More (q.v.) initiated a movement for the better circulation of Christian literature by putting forth a series of short religious tales in tract form, named the *Cheap Repository*. In 1795 the Religious Tract Society of Scotland (now known as the Religious Tract and Book Society) was founded in Edinburgh, by Rev. John Campbell. This was followed, in 1799, by the organization of the Religious Tract Society of London, which stands foremost in age and influence among tract societies of the present day.

In America the work of religious publication was begun by the Methodist Book Concern, which issued its first publication in 1789. The Massachusetts Society for Promoting Christian Knowledge, founded in 1803, may be properly regarded as the first interdenominational organization for tract work in America. This was followed by the formation of various local societies, among which were the New York Religious Tract Society, organized in 1812, and the New England Tract Society, organized at Andover in 1814. The latter society in 1823 changed its headquarters to Boston and its name to the American Tract Society, and two years later became merged in the American Tract Society, which was organized in New York City, on May 11, 1825, by friends of tract work, who desired to see a society of national scope and influence. Since that time tract societies have multiplied, but the American Tract Society still remains the principal agency for tract distribution in America.

A board of managers, consisting of a president, vice president, and 36 members, are elected annually by this society. This board elects the publishing, distributing, and finance committees. The members of these three committees constitute an executive committee to conduct the business of the society. To promote in the highest degree the objects of the society, the constitution specifies that the officers and managers shall be elected from different denominations of Christians, that the publishing committee shall contain no two members from the same ecclesiastical connection, and that no tract shall be published to which any member of that committee shall object.

Some idea of the magnitude of the work of this society may be gained from the following statistics. The whole number of titles of distinct publications (not including periodicals) issued by the society from the home office from 1825 to 1916 was 9117. These have been published in more than a score of different languages. The total number of volumes issued during the previous 90 years is 35,018,140; of tracts, 460,663,742; and of periodicals, 295,460,168, making a grand total of 791,142,050 copies of publications printed. Four periodicals are published: *American Messenger*, *Apples of Gold*, *Amerikanischer Botschafter und Deutscher Volksfreund*, and *Manzanas de Oro*. The society has made foreign cash appropriations amounting to $796,137, by the aid of which 5667 publications have been issued in 178 languages and dialects. It has also furnished electrotypes to foreign-mission stations to the value of $61,177.96.

Missionary colportage is an important feature of the society's work. Since its organization the missionary colporteurs of the society have circulated by sale and grant 17,326,937 volumes; they have made 18,406,676 family visits, and they have addressed 585,948 religious meetings. The total value of the Christian literature circulated gratuitously by the society since its formation amounts to $2,617,820.90.

During the 116 years of its existence the Religious Tract Society of London, England, has printed or assisted the printing of books and tracts in 282 languages, dialects, and characters; its annual circulation is over 65,000,000, and its total distribution to March, 1916, is estimated at over 540,000,000 copies of its publications.

In New York and many other cities there are city-mission and tract societies which find the printed page a valuable auxiliary in reaching the "submerged tenth." Many of the evangelical denominations have their own boards of publication or publishing societies, which employ tract literature, especially in aid of their Sunday-school work. In Great Britain, in addition to the Religious Tract Society, there are several other tract societies, such as the Monthly Tract Society and the Stirling Tract Enterprise. On the continent of Europe there are perhaps a score of societies which are engaged more or less in the publication and circulation of tract literature. Among the most important of these are the Paris Tract Society (Société des Traites Religieux), the Toulouse Religious Book and Tract Society, the Geneva Evangelical Society, the Italian Evangelical Publication Society of Florence, and the German Evangelical Book and Tract Society. In India, China, Japan, and other heathen lands there are a large number of tract societies which aim to provide Christian literature in the native languages.

Bibliography. The literature on the subject of tract societies consists chiefly of the annual reports, pamphlets, etc., published by the various societies themselves. *The Story of the Religious Tract Society for One Hundred Years*, by Rev. S. G. Green, D.D. (London, 1899), was prepared by an editorial secretary of the Religious Tract Society of London and is an authoritative history of that society. *The American Tract Society: An Historical Sketch* (New York, 1915), though but a brief pamphlet, presents the salient points concerning the history of the American Tract Society.

TRACY, trȧ'sē', **Alexandre de Prouville, Marquis de** (1603–70). A French soldier and administrator. After serving in several wars he was appointed lieutenant general of the French possessions in North America on Nov. 19, 1663, and reached Quebec, June 30, 1665, accompanied by many young nobles and 200 soldiers. In 1666 with 1300 men he led an expedition against the Mohawks, burned several of their towns, and forced them to sue for peace. This expedition greatly alarmed Gov. Richard Nicolls (q.v.), of New York, who attempted in vain to secure the aid of the New England Colonies for an expedition against the French. Soon after this expedition Tracy returned to France.

TRACY, Antoine Louis Claude Destutt, Count de. A French philosopher. See Destutt de Tracy.

TRACY, Benjamin Franklin (1830–1915). An American lawyer, soldier, and cabinet officer, born at Owego, N. Y. He was educated at Owego Academy and was admitted to the bar in 1851. In 1853 he was elected on the Whig ticket as district attorney of Tioga County and in 1856 was reëlected. Prior to this he took an active part in the formation of the Republican party in his State. In 1861 he was elected to the State Assembly. In 1862 he recruited the 109th and 137th New York Volunteers and became colonel of the former. For his gallantry in the battle of the Wilderness he received the congressional medal of honor in 1895. Wounded in this battle, he was compelled to relinquish his command, but within a year he again entered the army as colonel of the 127th United States Regiment of negro troops. Subsequently he commanded the prison camp at Elmira and at the close of hostilities was brevetted brigadier general of volunteers. From 1866 to 1873 he was United States District Attorney for the Eastern District of New York and from 1881 to 1883 was associate judge of the State Court of Appeals. As Secretary of the Navy in President Harrison's cabinet (1889–93) he did such important work in increasing the number of battleships and raising the standards of the service to a high level that he has been called the "father of the navy." In 1893 he resumed his law practice in New York and in 1897 was the unsuccessful Republican candidate for mayor of New York City. In 1899 he was counsel for Venezuela before the Anglo-Venezuelan Boundary Arbitration Commission. For many years he was head of the law firm of Tracy, Boardman, and Platt; this he left in 1900 to associate himself with Coudert Brothers. At the age of 83 he argued a case before the United States Supreme Court.

TRADE, Balance of. See Balance of Trade.

TRADE, Board of. A department of government in England designated "the lords of the committee of his Majesty's Privy Council appointed for the consideration of all matters relating to trade and foreign plantations." Cromwell in 1655 was the first to establish a permanent committee for matters of trade. Charles II continued the policy and in 1660 created two separate councils for trade and for foreign plantations, which in 1672 were consolidated into one. In 1786 the present department was established as a permanent committee of the Privy Council. The board as now constituted consists of the President, who is a member of the cabinet, together with the First Lord of the Treasury, the Chancellor of the Exchequer, and numerous other ex-officio members; but, like the Treasury Board, the Board of Trade does not meet and consists in practice of the President and his staff. It comprises the following departments: (1) The commercial, labor, and statistical department, whose principal function is the collection and dissemination of information concerning matters of trade. Since 1886 it has published the *Board of Trade Journal.* (2) The railway department, established in 1840, with numerous duties of supervision and inspection. (3) The marine department, established in 1850, which has general supervision over merchant shipping and the care of seamen. (4) The harbor department, whose province includes, besides lighthouses, harbors, etc., weights and measures, coinage, and other miscellaneous matters. (5) The finance department, which keeps the accounts for the board and audits for Parliament the reports of the life-insurance companies. (6) The fisheries department.

TRADE, Restraint of. See Restraint of Trade.

TRADE ASSOCIATIONS. Associations of men engaged in manufacture or trade, for the furtherance or protection of their mutual interests. In England these associations antedate the nineteenth century. In the United States some were founded before 1850; by 1890 they had been formed in most well-established industries; while by 1900 they had spread to almost every subdivision of the industrial world. Trade association may include one or more of three classes of functions—the commercial, the industrial, and the protective. Associations to do the work of business agencies display most clearly the commercial function. The London Association of Guardians for the Protection of Trade was established as far back as 1776. The operation of the earlier societies was confined chiefly to compilations of registers of bankruptcies, insolvencies, and private settlements with creditors. Societies may undertake investigations into the circumstances connected with a bankruptcy and perform the general agency business of their members. Later features are in connection with credit. Large commercial concerns furnish general information, but there is still room for information bureaus within some trades. Many establishments have special credit men, who have formed a national association, with branches in many chief cities of the United States.

The general industrial functions of trade associations include, first, the surveillance of important influences, such as legislation or railway rates, which affect the entire trade. With many associations the tariff question is a weighty and permanent issue, while laws affecting labor, the quality, the method of sale, or the inspection of goods (as in brewing or boiler making), are constantly watched, advocated, or contested. In the second place, associations may seek to establish agreement in business methods to keep their members informed of new inventions or processes, of market conditions, etc. A result of this activity is the publication of a trade journal, of which the *Bulletin of the National Association of Wool Manufacturers* (formed in 1864) is a well-known example. Various special functions are often assumed. Provision may be made for exhibits at fairs, trade schools may be encouraged, selling agencies established, bureaus of employment maintained, local improvements furthered, or, as in the lumber business, a system of mutual insurance may be attempted. An important function is the promotion of sociability and good will. It is not always easy to draw a line between the acts of a trade association and those of a trade combination in which the financial management has been centralized. At present the typical forms of protection are: (1) against introduction of so-called unfair methods within the trade, (2) against railroad discrimination in rates, and (3) against labor organizations. Jobbers' and retailers' associations protest against sales direct from manufacturer to consumer and sometimes establish a boycott against recalcitrant manufacturers. The decreasing importance of the jobber in the distributive system makes the efforts of their associations of interest. "Exclusive agreements" may be made by a middlemen's association with certain manufacturers, in which case no other but the latter's goods will be used. The object of certain associations is "to help the manufacturer decide who are legitimate dealers."

In trades where freight forms an important item of cost, a prime object of the association is likely to be adjustment of railroad rates. The National Association of Stove Manufacturers and the National Transportation Association, an organization of shippers, are examples. In 1903 the Georgia Sawmill Association took the radical move of disregarding the possibility of an appeal to the Interstate Commerce Commission and themselves asked for an injunction restraining certain Southern railroads from advancing rates on yellow pine. They asked that the Southern Freight Association be declared an illegal combination in restraint of trade. Increased demands of labor organizations in recent years have greatly stimulated defensive action by trade associations.

In the period 1906–16 there was a rapid growth of trade associations formed to deal with powerful and well-organized labor unions. Some are openly hostile to and oppose collective bargaining, some are willing to coöperate with the unions. The latter associations conclude agreements on wage scales and on conditions of labor with representatives of unions or federated unions in a particular industry. The control of the association over the individual member is relatively weak. Employers' associations have sometimes been started to coöperate with the union, but, failing to reach an agreement, have become bitterly opposed to the aims and methods of unionism. The National Erectors' Association is a case in point: organized in 1903, it treated with the unions, and, being unable to reach an agreement satisfactory to both sides, finally refused to treat further. A bitter struggle ensued, characterized by strikes and dynamite outrages. Many of the associations insist on the right of the employer to determine whom he shall employ and what the conditions of labor shall be. Frequently special employment agencies are maintained by the association to enable members to secure an adequate supply of nonunion labor. Some have been active in improving the conditions of labor, introducing safety systems, and promoting welfare work.

In the United Kingdom in 1912 there were 1079 local employers' associations and 83 federations and national associations of employers. These figures do not include those formed merely for purposes of trade protection, insurance, the diffusion of knowledge, or the advancement of technical knowledge. In recent years many associations of employers have been organized in Germany. The Federation of German Employers' Associations, one of several such organizations, had in 1907 a membership of 300 associations, with a total of over 1,200,000 men in the employ of their members. In Germany in 1913 there were 111 federations or national associations and 3320 local or district organizations, comprising as far as reported a membership of 145,207 employers, who employed 4,641,000 workmen. Most of these associations were principally concerned with the relations between their members and workmen. There are no satisfactory statistics of employers' associations in the United States. Consult: Hollander and Barnett, *Studies in American Trade Unionism* (New York, 1906); G. Kessler, "Die deutschen Arbeitgeberverbände," in *Schriften des Vereins für Sozialpolitik*, vol. cxxiv (Leipzig, 1907); Commission on Industrial Relations, *Final Report* (Washington, 1915).

TRADE-MARK. A mark, name, emblem, or device adopted by a tradesman or manufacturer and attached to or stamped upon his goods in some manner for the purposes of identification by the public and protection against the sale of fraudulent imitations. The law of trademarks is of modern development. In 1742 Lord Hardwick declared that he could not protect a trade-mark adopted by a trader from being used by another. It was not until 1803 that the English courts attempted to prevent the fraudulent use of an adopted trade-mark. Since that time the law on the subject has developed rapidly. The statute now in force in England is known as the Trade Marks Act, 1905. It provides for registration and makes the registry conclusive after seven years, unless the registration was fraudulent or contrary to morality.

The first trade-mark statute in the United States was passed in 1870. The salient features of the present law were enacted in 1905, although slight amendments were passed in 1906, 1907, and 1909. Under the decisions of the United States courts the office of a trade-mark is to indicate the origin or ownership of an article on which it is found. Therefore it follows that a valid trade-mark must fulfill one of the above essentials, either from its own nature or by reason of association with the article itself and the maker's name. A name which is merely descriptive of the qualities or nature of an article cannot constitute a valid trade-mark, as its use as such might tend to create a perpetual monopoly in the sale of the article. For example, the United States courts held that the words "acid phosphate" could not be protected as a trade-mark, as they were considered to be descriptive of the essential characteristics of the preparation sold under that name, and, as it was a known form of chemical combination, it would prevent others from describing accurately a similar combination.

In general, a geographical name cannot be used as an exclusive trade-mark; although the use of a geographical name as a trade name, where the article bears no relation to the name and is manufactured elsewhere, will sometimes be protected. Fantastic and newly coined words may be regarded as trade-marks. A person's own name will not be protected as a trade-mark as against a person of the same name who, acting in good faith, desires to use his name on his own goods. A trade name is therefore to be distinguished from a trade-mark and can be protected by a court of equity only where some one attempts to deceive the public and take another person's trade by adopting his trade name. A close imitation of a trade-mark may amount to an infringement, especially if there are other circumstances tending to show that there is an intention to deceive the public and take advantage of the business reputation of another. The use of the national emblem cannot in any sense constitute it a trade-mark. On the other hand an Illinois statute prohibiting the use of the American flag for advertising purposes has been held unconstitutional.

Any one who handles goods may impress his trade-mark upon them and be protected in its use if he has exercised any peculiar skill or judgment in their selection, care, or alteration. The right to an exclusive trade-mark may be lost by abandonment, but the evidence of the intention to discontinue using it must be very clear. A trade-mark is not generally considered to be property in the sense that it can be taken under an execution, but it may be transferred from one person to another, unless it is of such a nature that to allow it to be used on the goods of a person other than the one who originally adopted and used it would tend to deceive the public. The sale of a business, good will, etc., usually includes the trade-marks under which goods were sold by the owners. See COPYRIGHT; PATENT; TRADE NAME.

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TRADE NAME. A name under which a person or corporation does business and which by user becomes so associated with the good will of the business as to be valuable. A trade name is to be distinguished from a trade-mark which is affixed to or impressed on merchandise, and when registered is protected by statute. The wrongful user of an established trade name will be restrained by a court of equity on the ground that it constitutes fraud and deceit against the public and an unlawful appropriation of something which is so closely allied to the business of another as to be a species of property right. A trade name may sometimes be registered as a trade-mark, and this fact is the source of the confusion resulting from the use of these terms as being interchangeable. The statutes of most States prohibit one corporation from adopting the same name as another, and the Secretary of State should be consulted before a name is adopted for a new corporation. Furthermore, equity will protect a corporation in the use of its name. See TRADE-MARKS, and references there given.

TRAD'ESCANT, JOHN (c.1570–c.1637). A traveler, naturalist, and gardener, said to have been born in Holland. In 1620 he fought against the Algerine pirates. Afterward he was in the service of the Duke of Buckingham and seems to have become royal gardener. He established a physic garden and museum at South Lambeth and was the first Englishman to make a considerable collection of objects in natural history. His son JOHN (1608–62), born at Meapham, Kent, added largely to his father's collection and in 1637 visited Virginia, where he gathered "all varieties of flowers, plants, shells, etc." In 1656 he published his *Museum Tradescantianum: or a Collection of Rarities, Preserved at South Lambeth, Near London.* Upon his death the museum went by will to Elias Ashmole and in 1682 became the nucleus of the Ashmolean Museum at Oxford.

TRADESCANTIA, trăd′ĕs-kăn′shĭ-ȧ. A genus of monocotyledonous plants, including about 35 species, natives of tropical and temperate America, and commonly known as spiderworts. About 15 species are natives of the United States.

TRADE SCHOOLS. See TECHNICAL EDUCATION.

TRADE-UNION CONGRESS. A British federation of trade-unions, organized in 1868, which has met annually since that date except in 1871. At the time of its formation the British unions were engaged in an earnest struggle for favorable legislation, and the congress played an important part in securing the legislative victories of 1871–75. (See TRADE-UNIONS.) Since that time it has confined itself largely to the tasks of creating a favorable public opinion, voicing the demands of organized labor, providing a place for common meeting, and securing favorable labor legislation. The last function is exercised largely through a permanent parliamentary committee, the expenses of which are paid by a per capita tax upon the affiliated unions of £1 10s. per 1000 members. The parliamentary secretary devotes all his time to the work and receives a salary of £250 per annum. The congress itself is thus a deliberative body merely, but it has started two auxiliary federations—the Labor Representation Committee (see LABOR PARTY, BRITISH) and the General Federation of Trade-Unions. (See TRADE-UNIONS, THE GENERAL FEDERATION OF.) The membership of the trade-unions represented in the trade-union congresses in the United Kingdom increased from 110,000 in 1866 to 1,500,000 in 1890. At the Forty-fourth Congress, held in Newcastle in 1911, there were 127 trade-unions with a membership of 1,650,000 members represented. The total income for the year was £6928.

TRADE-UNIONS. "The term 'national trade-union,'" says the Federal statute providing for the incorporation of trade-unions, "in the meaning of this act shall signify any association of working people having two or more branches in the States or Territories of the

United States for the purpose of aiding its members to become more skillful and efficient workers, the promotion of their general intelligence, the elevation of their character, the regulation of their wages and their hours and conditions of labor, the protection of their individual rights in the prosecution of their trade or trades, the raising of funds for the benefit of the sick, disabled, or unemployed members, or the families of deceased members, or for such other object or objects for which working people may lawfully combine, having in view their mutual protection or benefit." No definition less complete is sufficient fully to indicate the complex character of the trade-union, since the trade-union has always been an insurance association and a social and educational club, as well as "a continuous association of wage earners for the purpose of maintaining or improving the conditions of their employment," as Beatrice and Sidney Webb define it.

History. The connection between the modern trade-union and the journeymen clubs of the Middle Ages is in dispute. Throughout the later Middle Ages and frequently after the fourteenth century traces are encountered of journeymen clubs—the German *Schenken*, the French *confréries de compagnons*—which maintained a more or less continuous existence, regulated apprenticeship, paid benefits, and engaged in conflicts with employers, characterized by the elements of the modern strike. Admitting, as Professor Ashley suggests, that the journeymen of these fraternities "were almost all unmarried, that when employed they lived in the master's house, that the masters themselves had usually been journeymen, that the number of masters and journeymen was very much the same," there nevertheless seems no tenable reason for denying to these associations the essential attributes of the modern trade-union. It is evident that effective and solid trade-unionism is intimately dependent upon the existence of a body of workers who will naturally remain wage earners throughout their lives. In other words, the trade-union follows in general the permanent separation of the employing and wage-earning classes. This separation, speaking generally, was a product of the industrial revolution and the factory system. Trade-unions consequently did not become numerous until late in the eighteenth century.

In England trade-unionism in the eighteenth century is marked by increasing hostility on the part of Parliament towards combinations of laborers. Laws regulating wages, apprenticeship, movement of laborers from parish to parish, etc., existed, and the activity of the trade-unions during that century seems to have been largely directed towards enforcement of those laws, which the employers did not always observe. Laws against combinations of workingmen in specific trades began to multiply as the doctrine of laissez-faire secured wider acceptance. These culminated in the Combination Acts of 1799 and 1800, by which every form of combination, whether of employer or employees, was rigidly prohibited. In effect, the acts were enforced against the laborers only. For 25 years the unions were driven into hiding, but were by no means extirpated. In 1824 the whole group of combination laws was repealed, but in 1825 a reaction set in, and in another statute the law against combination was revived, but it left laborers free to combine; to fix wages or hours of labor of parties to the combination.

The Act of 1825 was followed by the rise of labor organizations or general trade-unions of a Socialistic nature described under LABOR ORGANIZATIONS. But the trade-union proper was making steady progress within the separate trades, in which identity of interests made unity of organization and policy a comparatively easy task. About 1850 a reaction against the strike set in, and reforms in the management of the friendly-benefit system were inaugurated. The union which applied the new ideas most successfully was the Journeymen Steam Engine and Machine Makers' and Millwrights' Friendly Society, which in 1850 absorbed other large unions of mechanics and became the Amalgamated Society of Engineers, whose careful set of rules for the financial and general administration of the union served, according to Mr. and Mrs. Webb, as the "model for all national societies" founded between 1852 and 1889. The reaction from the Socialistic trade-unionism of the thirties brought to the front a remarkable group of labor leaders, acute, tactful, industrious, and conservative, who (1860–75) united in a persistent and energetic campaign for legislative reform. The first victory came in the Master and Servant Act of 1867, which corrected the most glaring defects of the old law on this subject. The union leaders, however, aimed at more sweeping concessions. By the celebrated Trade-Union Act of 1871 it was provided that no trade-union should be deemed illegal simply because it was in restraint of trade, and unions were given a legal standing carrying with it protection of their funds, without exposing them to the ordinary obligations of an incorporated company. Finally in 1875 the unions secured the passage of a very liberal Employers' and Workmen's Act (replacing the Master and Servant Act of 1867), and a revolutionary Conspiracy and Protection of Property Act, which expressly permitted peaceable picketing, and provided that no combination to do any act in furtherance of a trade dispute between employers and workmen should be indictable as a conspiracy unless such act if committed by one person would be punishable as a crime.

In 1860 a giant stride towards collective bargaining was taken by the formation in the hosiery trade of the first joint conference between employers and employees for peaceful settlement of trade disputes. Federation of trade-unions began; trade councils became common in the cities, and in 1868 the first national Trade-Union Congress was held at Manchester. Finally the successful legislation of 1871, like that of 1824, was followed by an expansion of trade-unionism and the reappearance of many of the phenomena which had marked the epoch of labor organizations in the thirties, with their ideal of an aggressive, militant organization, free from the incumbrance of friendly benefits, embracing workingwomen and unskilled labor, participating actively in politics, and with tendencies towards Socialism.

The most noteworthy event of late years is the formation in 1899 and 1900 respectively of the General Federation of Trade-Unions (see TRADE-UNIONS, THE GENERAL FEDERATION OF) and the Labor Representation Committee, later the Independent Labor party. Between 1892 and 1911 inclusive the membership of British trade-unions grew from 1,500,451 to 3,010,346.

In the United States there is no positive record of a trade-union before 1803, the year in which the New York Society of Journeymen Shipwrights was incorporated. In 1806 a union of the House Carpenters of the City of New York was organized, and the first union of the Journeymen Tailors is said to have been organized in the same year. As early as 1817 the New York Typographical Society had been in active existence for some time, and in 1822 the Charitable Society of Shipwrights and Calkers of Boston and Charlestown was formed.

The most important events of the period 1825–50 are briefly described under LABOR ORGANIZATIONS. For a time trade-unionism seems to have become involved in general reform; wide-reaching and ambitious federations were formed which worked at the same time for the abolition of slavery, for woman's rights, land nationalization, and coöperation, as well as improvement of conditions of employment. During this period trade-unionism proper was undoubtedly making progress in the separate trades, and by 1840 in the principal industrial centres local unions had been organized among masons, marble cutters, shoemakers, saddlers, hatters, tailors, printers, bricklayers, roofers, painters, carpenters, and shipworkers.

The 15 years between 1850 and 1865 may well be described as the period of nationalization. Labor leaders had learned that for a time the labor movement must go forward cautiously, that participation in politics and broad attempts to reform things were dangerous, that labor organizations must be extended within trade lines and not by all-embracing amalgamations. In 1850 the union now known as the International Typographical Union was organized. (See TYPOGRAPHICAL UNION OF NORTH AMERICA, THE INTERNATIONAL.) This was probably the first American national union, though there is some reason to believe that the Silk and Fur Hat Finishers' National Association was organized as early as 1843. The National Association of Hat Finishers of the United States of America was founded in 1854, the National Protective Association (the Locomotive Engineers) in 1855, the Sons of Vulcan and the National Spinners' Association in 1858.

Since the Civil War many local and national unions have been organized, their government has been perfected, their administration improved. A number of vigorous labor journals have appeared; labor parties have been formed and in places have elected labor candidates; permanent boards of collective bargaining or arbitration and conciliation have been formed in many trades; boycotting through the union label and labor press has been systematized and developed; favorable legislation has been secured in every State; and, more important than any other result, public opinion has been brought to concede the utility and even the necessity of the trade-union. The most striking phenomenon of the epoch has been the formation of large federations of unions. Among these larger organizations may be named the National Labor Union (1866), the Knights of Labor (1869), the International Association of Workingmen (1864), the Industrial Brotherhood (1873), the American Federation of Labor (1881), the National Building Trades Council (1897), and the American Labor Union (1898). By far the most important of these is the American Federation of Labor. (See LABOR, AMERICAN FEDERATION OF.) Until 1906 this organization avoided direct participation in politics, confining itself to the organization of new unions, the passage of legislation favorable to labor, the extension of the union label, etc. In 1906, on account of alleged violations of the Federal labor laws, the American Federation decided to enter politics. It concentrated its efforts upon defeating a number of congressional candidates who were said to be especially hostile to organized labor, but its efforts were without success.

Statistics of Trade-Unions in the United States. These are collected by the labor bureaus of a few States, but no complete enumeration for the whole country has ever been made. The report of the Industrial Commission gave the estimated membership of labor organizations in the United States on July 1, 1901, at 1,400,000. The average membership of the American Federation of Labor alone during the year ending Sept. 30, 1911, was 1,761,835.

	NEW YORK STATE		AVERAGE MEMBERSHIP OF AMERICAN FEDERATION OF LABOR		GREAT BRITAIN	
YEAR	Organisations	Membership	Organizations	Membership	Organizations	Membership
1892	....	......			1,203	1,500,451
1893	....	......	...	....	1,259	1,478,474
1894	860	157,197	...	....	1,299	1,437,765
1895	927	180,231	...	....	1,303	1,404,898
1896	962	170,296	...	....	1,308	1,491,007
1897	1,009	168,454	75	264,825	1,287	1,609,909
1898	1,087	171,067	110	278,016	1,310	1,688,531
1899	1,320	209,020	158	349,422	1,302	1,848,570
1900	1,635	245,381	181	548,321	1,272	1,955,704
1901	1,881	276,141	221	787,537	1,282	1,969,424
1902	2,229	329,098	226	1,024,399	1,250	1,954,594
1903	2,583	395,598	374	1,465,800	1,237	1,931,558
1904	2,504	391,676	174	1,676,200	1,211	1,901,674
1905	2,402	383,236	200	1,494,300	1,209	1,928,569
1906	2,420	398,494	189	1,454,200	1,232	2,122,241
1907	2,497	436,792	237	1,538,970	1,221	2,419,816
1908	2,444	372,459	181	1,586,885	1,195	2,383,244
1909	2,368	372,729	192	1,482,872	1,168	2,362,450
1910	2,457	481,924	255	1,562,112	1,153	2,435,704
1911	2,498	504,314	209	1,761,835	1,168	3,010,346

A more satisfactory idea of the growth of trade-unions may be gained from the preceding table, in which the total membership of unions in Great Britain and New York is given, and the average membership reported or paid upon to the American Federation of Labor.

Trade-Unions and the Law. The development of the law in the United States has been different from that in England. A few early cases are recorded in which trade-unions were declared illegal, but as early as 1821 in Pennsylvania and 1842 in Massachusetts a view diametrically opposite to the English law was taken, and since has been consistently maintained by American courts, except in so far as it has been modified in recent years by antitrust acts. Workmen may combine to improve conditions of employment and agree not to work for less than a certain amount or to refuse to work for employers paying less than this amount without active interference from legal authorities; and in several important cases the courts have gone to the point of recognizing the legality of the by-laws of unions and even of enforcing them (Master Stevedores' Association *v.* Walsh, 2 Daly, 1; People *v.* Musical Mutual Protective Union, 118 N. Y. 101). Legislatures have gone even further than the courts in recognizing the legality of the purposes of trade-unions. The Federal government and many of the largest States have enacted statutes providing for the incorporation of trade-unions under exceptionally favorable conditions. But only a few unions have taken advantage of the incorporation laws, and labor leaders generally oppose this, on the ground that it would subject the unions to many vexatious and costly suits at law. The State legislatures have also conferred several special privileges upon labor organizations. Massachusetts and Kansas, e.g., have exempted labor organizations from the operation of the statutes regulating fraternal beneficiary associations; and some of the States have passed statutes prohibiting employers from discharging workmen for joining labor organizations and even from making it a condition of employment that they should not belong to such organizations. A few States and many local legislative bodies have enacted laws providing, directly or indirectly, that certain public work—usually printing—shall be performed only by union labor. Within recent years the legal status of trade-unions has been seriously affected, at least in theory, by the so-called antitrust acts passed by Congress and many State legislatures, making contracts or combinations in restraint of trade or commerce illegal. The Federal statute—concerned, of course, only with interstate trade and commerce—has been held to apply to a labor organization of draymen and longshoremen (United States *v.* Workingmen's Amalgamated Council, 54 F. R. 994); and the same interpretation will probably be given to the State statutes save where they are specifically labor organizations. Little attempt has been made to dissolve unions or punish their officers under antitrust statutes, but where these laws apply the legality of the most reputable unions is threatened.

Trade-Unions in Other Countries. While probably the germs of labor organizations in almost every country of continental Europe may be found in earlier and even in mediæval organizations and movements, they owe their present strength, spirit, and methods chiefly to the Socialistic propaganda; most of them have remained in close connection with the Social Democratic parties, and many of them—particularly in France, Belgium, Italy, and the Scandinavian countries—are as much political clubs as trade-unions. (See SOCIALISM.) There are, however, a number of strict trade-unions on the Continent—particularly among printers—and this number is increasing. As the continental labor-union grows more powerful, it manifests a stronger disinclination to be treated as a mere appendage of a political party. The continental union was late in developing. The year 1864, which marks the formation of the International Workingmen's Association (see INTERNATIONAL WORKINGMEN'S ASSOCIATION), furnishes a substantially accurate date for the beginning of the trade-union movement on the Continent.

The political character of continental unionism has decreased its efficiency by dividing the forces of labor into several semihostile groups. In Germany, e.g., we find the labor organizations divided into three distinct classes: a group of "peace" unions, known as the Hirsch-Dunckersche Gewerkvereine, assert the essential harmony of interests between employers and employees and depend upon arbitration and friendly benefits rather than strikes for the improvement of the conditions of employment. Clearly distinguished from the former by their aggressive methods in general are the socialistic Gewerkschaften, which in turn are divided into two groups over the question of direct participation in politics: the unions federated under the Central Commission advocating a separation of the labor and the Socialistic movements, and the local organizations opposed to this separation. The Christian Unions constitute a third class distinct from and opposed to the preceding groups by their anti-Socialistic principles. In Belgium the labor organizations have been practically dominated by the political parties. In France the factional quarrels of the Socialists have been carried into the labor organizations,

COUNTRY	Beginning of the modern movement	APPROXIMATE MEMBERSHIP OF LABOR ORGANIZATIONS		EXPLANATORY
		Date	Number	
Netherlands.........	1811	1907	128,845	Freedom of combination was granted in 1811; chief development did not come until later.
Belgium............	1840	1905	148,483	
Switzerland.........	1858	1911	78,119	Labor Bureau in 1907 estimated that 20 per cent of labor was organised.
France..............	1874	1911	1,029,238	In addition there were 912,944 persons in agricultural associations and 40,145 members of mixed associations of employers and employees.
Germany............	1865			
Austria.............	1867	1911	421,905	In the general federation of Gewerkschaften.
Denmark............	1871	1911	128,224	
Norway.............	1871	1910	46,397	
Sweden.............	1883	1911	85,387	

with the consequence that in almost every city the trades are grouped into several hostile unions whose antagonism makes unity of action almost impossible. In Australia, on the other hand, where according to some authorities as many as 75 per cent of the male workingmen belong to trade-unions and where the unions have secured a large proportion of their victories by political action, Socialism has made little headway.

With the view of giving some idea of the beginning and extent of labor organization in the various continental countries, the tabular statement (page 403) has been prepared. It is almost impossible to distinguish the labor organizations from the political clubs and fraternal associations in many countries, so that the figures must be interpreted as rough estimates of the extent of labor organization in the several countries rather than exact statistical measurements.

Classification of Trade-Unions. As was pointed out under LABOR ORGANIZATIONS, the trade-union is simply one branch of the great family of labor organizations. The following classification brings out clearly the great diversity of structure which exists both among organizations of laborers and among trade-unions themselves:

- LABOR ORGANIZATIONS
  - Continuous
    - Not on the trade principle
      - Political,* e.g., Independent Labor party.
      - Fraternal,* e.g., Ancient Order of United Workmen.
      - Mixed assemblies, e.g., Knights of Labor.
      - Industrial unions, e.g., United Mine Workers.
      - General amalgamations, e.g., Knights of Labor.
    - On the trade principle
      - Nonfederative
        - Sublocals, e.g., Printers' chapels.
        - Local unions, e.g., "Big Six" of New York.
        - District councils, e.g., of Carpenters and Joiners.
        - National unions, e.g., Iron Molders' Union.
        - International unions, e.g., Cigar Makers' International Union of America.
      - Federative
        - Central unions, e.g., Chicago Federation of Labor.
        - State federations, e.g., Massachusetts Federation of Labor.
        - Industrial federations, e.g., National Building Trades Council.
        - General federations, e.g., American Federation of Labor.
  - Temporary
    - Strike
    - Boycott

The preceding classification emphasizes the difference between amalgamated labor unions and trade-unions or federations in which the individuality of each trade is preserved. The "mixed assembly" is simply the governmental unit of the amalgamated union. It was a permanent feature of the Knights of Labor, but it is also used by the Federation of Labor, and is known as the "federal union." It supplies a union for workmen in unorganized trades, or in places where there are not enough workers in one organized trade to start a local union. The industrial union is merely a centralized union, in which are united all the workers of any one industry, irrespective of trade or occupation. The United Mine Workers, e.g., aim to coalesce in the same local union all wage earners "working in and about the mines except mine manager and top boss." There are also industrial unions which do not aim to unite all classes of workmen in the same locals, but which attempt to unite local unions of the different trades in a single national body. The latter are to be regarded as federations of trade-unions rather than labor organizations. The "central" or "central union" is merely another name for the municipal federation of trade-unions.

Government. The government of local unions is distinguished by its thoroughgoing democracy. The tenure of office is usually six months, and there is a widespread feeling in favor of rotation in office. The most important local officers are the business agent or walking delegate and the chairman of the grievance committee. Only a small proportion of the locals have such officers, but where they do there is a strong tendency to reëlect men who have proved themselves the possessors of the unusual abilities which these positions require. The government of the national union usually comprehends a periodical convention, a permanent executive board, a corps of organizers, a president, several vice presidents, and a secretary treasurer. As the referendum is apparently becoming more and more popular in America, the general membership must be counted in many unions as the ultimate source of legislative power, and indeed of the judicial and executive power, as well as in the numerous cases in which the general membership decides appeals, votes strikes and special assessments, etc. In unions which do not employ the referendum system the supreme executive and judicial powers are vested in the periodical conventions and in the executive boards between conventions, but, as these boards are usually composed of unsalaried workmen living in different cities and conducting their deliberations by mail, it frequently happens that their powers are virtually exercised by the president, who, with the vice president and secretary treasurer, almost invariably have seats in the executive board.

Problems of Organization. The difficulties of labor organizations show themselves in bitter disputes between unions. In the first place, there are disputes between dual unions. This is a trade war between rival unions which claim control of the same trade and the same field. Secondly, jurisdiction disputes are likely to arise. These may be divided into several classes, according to the cause of the conflict. (*a*) Territorial disputes. A typical instance is noted in the Twenty-fourth Annual Report of the Bureau of Statistics of New Jersey. Here the work on a large building was seriously interrupted for months by a quarrel between the New York and Newark local unions of the International Brotherhood of Electrical Workers, the New York union claiming exclusive right to all work in Newark in accordance with an agreement made with the international union. The dispute was finally settled by an agreement, in accordance with which the Newark union was given "one-half the jobs which a New York contractor may have to dispose of on a building in Newark, the Newarkers to have the New York rate of wages." (*b*) Demarcation disputes, arising from conflicting claims to certain work lying midway between two distinct trades. The shipbuilding industries on the Tyne, e.g., were tied up for 18 months or more at one time by demarcation disputes which hinged largely about the "limit of the size of the iron pipes to be fitted by the engineers and the plumbers respectively, and whether the joiners should or should not be confined to woodwork of one and one-half inches' thickness." (*c*) The third class consists of those arising between a more extensive and a less extensive union, concerning the autonomy of the latter. Thus, the increased division of labor in the printing trade made of the pressmen a separate class, and new inventions produced the stereotyper and electrotyper. It was inevitable that these classes should desire trade independence, and that the original union should oppose all secessions. There has been a long series of conflicts between the old Typographical Union and bodies of discontented pressmen, bookbinders, stereotypers, and electrotypers. (*d*) Industrial organization versus trade autonomy. A similar but far more important source of jurisdiction disputes is the rapidly growing practice of adapting labor organization to industrial organization and uniting in one union all the trades represented in a single industry. Industrial organization inevitably brings the union adopting it into conflict with the unions of the separate trades represented in the industry. Thus, the United Mine Workers have had serious conflicts with the stationary firemen and the blacksmiths, and the brewery workers have been in constant strife with the painters and coopers, the team drivers, etc. In the strike and in all phases of collective bargaining industrial organization is superior, both for employers and employees. On the other hand, the subordination of a minority of skilled workers to a larger number of less skilled craftsmen is frequently a source of weakness and always a source of dissatisfaction.

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* These are not strictly labor organizations, but are included here because their membership is drawn almost exclusively from the ranks of labor.

Ultimate Form of Organization. One of the most persistently advocated remedies for jurisdiction disputes has been that of amalgamation, the form of organization in which all the trades are coalesced in a strong central union. Amalgamation has never proved practicable. United action is plainly necessary, but it must be secured by federation and not by consolidation. Another remedy for the jurisdiction dispute, tried with only partial success, is the "jurisdiction statement." The constitution of the National Building Trades Council, e.g., provides that "all organizations affiliated with any local Building Trades Council shall plainly and satisfactorily define the class of work they claim, and no trade will be permitted to do the work pertaining to another." Up to the present, the jurisdiction statement has been of but little use in preventing conflicts between unions. The indications are strong that the ultimate structure of union organization will be complex; that the unit of government will be the simple trade-union of the old type, but that these unions will be combined in a very large number of cross-cutting federations, each distinct and independent, but all of them formed, as it were, of the same material. The simple trade-union will probably retain jurisdiction over such questions as industrial education, apprenticeship, and friendly benefits. On the other hand, the regulation of the strike and the settlement of demarcation disputes will in all probability come within the province of industrial federations, which are even now multiplying rapidly. The industrial federations have come to stay. Yet there will undoubtedly be additional federations. The broad general federation represented at present by the American Federation of Labor will surely persist, devoting itself particularly, as the federation does, to education of the working classes, the rapid extension of labor organization, the promotion of favorable legislation, the defeat of unfavorable legislation, the wider use of the boycott, and the maintenance of a labor press. It is probable that the time is almost ripe for political action by labor organizations. But past experience teaches unequivocally that almost without exception the entrance of trade-unions as such into politics has proved disastrous. Such being the case, it is probable that the trade-union will enter politics by means of distinct political federation. A striking example of this is the Labor Representation Committee (see LABOR PARTY, BRITISH) of Great Britain.

METHODS AND POLICIES OF TRADE-UNIONISM

Trade-Unionism and Monopoly. Probably no social institution in existence represents the change from the old economic policy of laissez faire more concretely than the trade-union. Almost every method adopted by trade-unions is in essence a regulation of competition. The essential function of the trade-union is collective bargaining; and the first condition of successful collective bargaining on its part is that it shall secure substantial control of the efficient supply of labor. In securing and maintaining such control two policies are adopted, a policy of inclusion and one of exclusion. To obtain control of a particular trade in a particular jurisdiction, the utmost effort will be made to bring into the union every effective competitor for work to be done in that jurisdiction. Once having control, there is the strongest temptation, if not a real necessity, for limiting the supply of craftsmen by regulation of apprenticeship, etc. Many trade-unions prosecute the work of organization vigorously and incessantly. In the beginning trade-unionism was sporadic and instinctive, and the national union was the product of the amalgamation of two or more self-organized locals. At present organization is deliberate, systematic, and proceeds from the top down; the local is the child rather than the parent of the national. Even exclusive unions like the Window Glass Workers enter heartily into the work of organizing the unskilled workers, because with the increasing use of machinery this body constitutes a constant menace to all trades. The organization of wage earners is the special work of the Federation of Labor. In 1911, e.g., an aggregate amount of $46,962.05 was expended by the federation to defray organization expenses. Of this amount $2,020.15 was paid to district or volunteer organizers, while the remaining amount was paid to 49 salaried organizers of the federation. New charters were issued to three international unions, 61 city central bodies, 207 local trade-unions, and 55 Federal labor unions.

Restriction of Membership. In almost every American union the applicant for admission must be accepted by the local which he desires to enter, and in voting upon applicants a minority of the members—in some important unions as few as three blackballs—are usually sufficient to exclude the candidate. But in most American unions the terms of admission are purely nominal.

Entrance to a Trade. Trade-union regulations concerning the entrance to a trade fall under four heads: apprenticeship, limitation of boy labor, progression within the trade, and the exclusion of women. Boy labor will be treated with the limitation of apprenticeship, while the regulation of promotion within a trade is not a question of great practical importance in American unions, except perhaps in the union of Post Office Clerks, where for obvious reasons the regulation of promotion becomes the main object. The exclusion of women is no longer attempted by American or English unions, the only case to the contrary in the United States known to the writer being that of the Upholsterers' International Union of North America. Nevertheless, only a small proportion of the female breadwinners are organized. In Great Britain, e.g., in 1911 the women and girls constituted only 9 per cent of the members of trade-unions and were found in only 187 out of the 1168 unions, though the census of occupations showed that the female breadwinners were nearly one-third as numerous as the males. In 1912 in New York State the women constituted 7 per cent of all members of trade-unions.

Regulation of Apprenticeship and Boy Labor. The regulation of apprenticeship was not in origin a trade-union policy; it was introduced, adopted, and sanctioned by statute law at a time when the trade-union did not exist. Consequently, although the trade-unions indorse the regulation of apprenticeship with striking unanimity and still regard it as an ideal, such regulation is at present enforced only in an insignificant number of trades and seems to be disappearing. The apprentice system is much less prevalent in the United States than in Great Britain; and in the latter country in 1897 Mr. and Mrs. Webb estimated that out of 1,490,000 members of the trade-unions only 90,000 belonged to unions actually able to enforce apprentice regulations. The desirability and expediency of the regulation of apprenticeship by trade-unions are questionable. An examination of the apprenticeship regulations of the few American labor-unions which are able to enforce them shows that the educational motive is decidedly a minor one, while these regulations exercise no perceptible effect in checking child labor under any given set of conditions. On the other hand, unions which have acquired sufficient power to regulate apprenticeship have evinced a strong disposition to restrict unduly the number of apprentices. A wide examination of the apprenticeship regulations of American unions shows that the average period of apprenticeship is more than three years and the average number of apprentices to journeymen somewhat less than 1 to 10. Finally—and this seems conclusive—the restriction of membership to workmen who have been apprenticed is not necessary to the successful operation of the union. The United Mine Workers, the Locomotive Engineers, the Carpenters and Joiners, and in fact most of the large unions, in practice if not in theory, are completely open.

Monopolistic Alliances between Trade-Unions and Employers' Associations. The evil possibilities of the policy of exclusion are well illustrated in occasional compacts between trade-unions and combinations of manufacturers in which the two organizations combine to monopolize a certain industry for the benefit of both. In the Birmingham (England) Metal Trades these alliances, as they are called, were common about 1897–98. The essential feature of the Birmingham alliance was an agreement by which the employers bound themselves to employ none but union men, in return for which the latter agreed to work for no manufacturer who sold his product at prices less than those formally adopted by a wages board composed of an equal number of employers and employees. For every advance in price there was to be a proportionate, though not an equal, advance in wages. Monopolistic alliances of this kind are rare and as a rule not lasting.

Regulation of Wages. The most essential function, as well as the explanation and justification of trade-unionism, is the determination of the conditions of employment by collective instead of individual bargaining. The most important condition of employment is the rate of wages, as is well illustrated by the fact that in both England and the United States more than 50 per cent of the strikes which occur are from wage disputes. The conditions and characteristics of the regulation of wages by trade-unions may be briefly summed up: (1) The standard rate as maintained by American unions is a local rate fixed by the local union. In a few trades working largely by piece, such as the Potters, Glass Blowers, etc., the scale of prices is fixed for the whole country by the national union; and in a few other unions, such as the Brewery Workmen and the United Hatters of North America, a national minimum time rate is prescribed. But in the vast majority of unions the regulation of wages is left wholly to the local union, and no strong demand for uniformity seems to exist. (2) Contrary to general opinion, the majority of trade-unions, in trades in which it is possible, favor work by the piece-rate system. In England Mr. and Mrs. Webb have made a careful study of the wage system of every trade-union having more than 1000 members, unskilled laborers and transport workers excepted. Of these, 111 unions, having 1,003,000 members, were examined; 49, with 573,000 members, insisted on piecework; 24, with 140,000 members, willingly recognized piecework; and 38, with 290,000 members, insisted on time-work. A similar investigation in the United States was made by the Industrial Commission. Information was secured concerning 50 important unions in which piecework was possible. Of these unions 28 accepted the piecework system in some department without active opposition, while 22 unions either forbade or actively discouraged piecework. The reasons for this are clear. In some occupations, such as spinning and weaving, the intensity of the labor is determined by the speed of the machine, or, speaking generally, the employer finds it possible to set the pace for the employee. In such occupations it is evident that the workers will insist upon piece payment to prevent forcing and overexertion. In other occupations, such as ordinary carpentering or repair work in general, it is impossible to estimate how much skill or time will be required to perform a given job or piece, and here the time rate is the workman's only defense against exploitation. The testimony collected by the Industrial Commission amply proves that the majority of the labor leaders of the United States would abolish the piece-rate system instantly if it were possible. The leaders hold that under the piecework system the most proficient workmen set the pace and fix the standard rate, thereby depressing the earnings of the less talented but no less industrious or deserving shopmate. In addition the argument is made that the piece-rate system either encourages excessive production and thus depresses prices, or throws the work into the hands of a few workmen, thus increasing the amount of nonemployment, both of which results tend strongly to reduce wages. The feeling is also prevalent that the piece system stimulates employees to overexert themselves and to work themselves out at an early age.

The piece system in practice may be, and often is, manipulated to the injury of the general body of wage earners. It is true that employers are disposed to reduce piece rates as soon as the more efficient workmen in their employ demonstrate an ability to earn an unusually high rate by the system; and furthermore, the testimony seems convincing that in many instances the piece-rate system leads overambitious employees to injure their health in the attempt to earn high wages; but the objection to piecework on the ground that it leads to overproduction, and the defense of a uniform wage irrespective of productive power, are untenable, if not from the standpoint of the trade-union, at least from the standpoint of the general public.

Hours of Labor. The regulation of the hours of labor is an important function of the trade-union, as the question of the working day is primarily one of health, morals, and the necessary leisure for education and social and religious duties. In this respect the trade-unions have from the beginning placed unusual reliance upon the law. But they have also worked incessantly to reduce the hours of labor by direct negotiations with employers, by strikes, and by boycotts.

The normal day, like the standard wage in most American unions, is generally left to the separate locals, and even in the few nationals which have a maximum working day for the whole country the locals are left free to secure a shorter working day if possible. But although the locals have wide discretion in fixing the normal day, the national organizations and leaders constantly urge them to reduce the number of hours, and among the national organizations strong enough to lead in this matter, laws requiring increased rates for overtime, or wholly forbidding overtime except in cases of extreme emergency, are common.

Restriction of Output. The preceding section makes it plain that trade-unions do restrict the industrial output openly and systematically. The restriction of the output of individual workers is accomplished in several ways: by adopting a normal day and discouraging or prohibiting overtime; by limiting the daily task or the earnings of pieceworkers; by discouraging or prohibiting the grading of time-workers and thus leveling wages; by forbidding piecework, time-work, contract jobs, or the butty system; and in some cases by encouraging the go-easy system of secret loafing, or the "adulteration of labor."

A variety of arguments are brought forward in defense of the general policy of the limitation of output. Trade-unions claim that this is the only way of preventing overexertion on the part of workmen, particularly under the piece system; that it tends to prevent unemployment and moderates the destructive competition of the army of the unemployed; and finally, that it tends to prevent overproduction. There is a large degree of truth in all these contentions. The history of the factory system is one long proof of the truth that, under a régime of freedom of contract in the sale and purchase of labor, wage earners are driven by the employers and led by the pace of the hardier workmen to impair the health both of themselves and their offspring. It is true also that increased leisure, wisely spent, tends to elevate the standard of life, and that wages are in a measure determined by the standard of life; that collective bargaining presupposes given rules based upon the average efficiency and endurance, thus restraining in its operation the strongest workmen from doing their utmost; that in periods of temporary depression distributive justice sanctions a limitation of the work and income of each, in order that all may have some work and some income.

No judgment upon this subject may, however, be rendered except in concrete cases. When the United Mine Workers demand an eight-hour day in underground mines, the justice of the demand seems unanswerable; when the Window Glass Workers insist on a four months' stop each year, the demand is questionable; but when the Chicago plumbers limit, as they did in 1889, the amount of work in some branches to about half as much as could be performed by an able-bodied workman without undue strain, the demand is prima facie inequitable.

The point is even clearer in the limitation of wages as distinct from the limitation of hours. That the Detroit Stove Founders should limit piece earnings per day to $4.50 may seem reasonable as a preventive of overexertion; but that time-workers, like stonecutters, carpenters, and coopers, should oppose the payment of more than the standard rate to exceptionally efficient workers, or that the machinists should oppose a classification of their workmen by the War and Navy departments, thus forcing all to the level of the idlest or most incompetent, seems indefensible.

Attitude towards Machinery. Historically trade-unions have opposed the introduction of labor-saving machinery, but, speaking generally, the unions have realized at last that it is impossible effectively to oppose the introduction of labor-saving devices; and among trade-union leaders the number of those who fully realize that the machine in the long run is the friend and ally of the wage-earning classes is rapidly increasing. Trade-union leaders may be said in general to have learned how to meet successfully the industrial problems caused by the introduction of machinery. Thus, when the printers were confronted with a great decrease in the demand for labor as a result of the invention of the typesetting machine, the Typographical Union met the problem in a rational manner. It insisted that the operators of the machines should be selected from ordinary printers, and that they should be paid as much at least as the wages of the hand printers. For a short time large numbers of printers were thrown out of employment, but in three years, according to the estimate of the president of the Typographical Union, the increased demand for printers, consequent upon the decrease in the cost of printing, afforded work for more than the old supply of printers. The justice of trade-union regulation respecting the use of machinery must in each case be decided in accordance with its intent. Trade-unions are justified in the attempt, if not clothed with the duty, of lessening hardships occasioned by the introduction of labor-saving inventions. It is permanent antagonism to machinery which is hopeless and economically fallacious.

Trade-Union Insurance. Mutual insurance—aid to the traveling journeyman in search of work, assistance in case of sickness, and a collection to defray burial expenses—was perhaps the principal function of the trade-union of the eighteenth century and still constitutes a principal function of trade-unionism in foreign countries, particularly in England. In the 13 years (1898–1910), e.g., the 100 principal trade-unions in England expended $2,948,314 in dispute or strike pay, $6,656,632 in unemployment benefits, $10,997,694 in other benefits, and $5,567,926 for administration expenses.

Among American unions, however, conditions are entirely different. Of 115 international unions reporting to the Federation of Labor in 1911, 71 paid death benefits to the amount of $1,471,381.37, 29 paid $818,556.88 in sick benefits, 8 paid traveling benefits of $58,784.71, 3 paid tool insurance to the amount of $5,648.70, and 16 paid total unemployment benefits of $218,742.71.

While it is evident that the friendly benefit is not essential to the successful conduct of a trade-union, it is also true that the leading American labor leaders strongly advise the institution of the benefit system, and in unions maintaining this system it has been of immense service in accumulating large reserve funds, in forcing obedience from members, in preventing them from dropping out when their interest wanes, and in stimulating a more conservative policy in general. The powerful Cigar Makers' International Union, e.g., and the railroad brotherhoods furnish illustrations of the advantages of the insurance system as an auxiliary to trade-unionism. (See RAILWAY BROTHERHOODS.) The insurance function, however, is strictly subordinate, except in one or two organizations. The insurance funds are unprotected and may be expended in strikes, trade wars, or for any purposes meeting the approval of constituted authorities. After having paid insurance assessments for years the individual member may be expelled for a trifling infraction of rules, or may see the insurance system abolished and all funds dissipated in supporting a sympathetic strike. Nevertheless the individual members acquiesce in this condition of affairs and oppose any attempt at regulative legislation. The widespread opposition of trade-unions to incorporation rests largely upon the belief that it would destroy this unlimited freedom in the use of insurance funds.

Collective Bargaining, Arbitration, and Conciliation. Modern political economy recognizes in collective bargaining a legitimate and the most important function of trade-unionism. This concerted action, by which employers are prevented from fixing wages at the rate acceptable to the neediest competitor, is the goal and aim of trade-unionism. The walking delegate, or business agent, who represents a body of union workmen, advises them what rate of wages to demand, and conducts their negotiations for them, is thus not an ugly incident, but an essential necessity of trade-unionism—the very heart of the institution.

In England systematic collective bargaining by recurrent joint conferences was first introduced in the hoisery trade about 1860. At the present time Mr. and Mrs. Webb estimate "that in all skilled trades where men work in concert on the employer's premises 90 per cent of the workmen find either their rate of wages or their hours of work and often many other details predetermined by a collective bargain in which they personally have taken no part, but in which their interests have been dealt with by representatives of their class." And in the United States the system has been introduced to an extent scarcely realized by the general public. Thousands of local agreements exist in the cities, particularly in building industries; in about a dozen trades national agreements exist. The history of trade arbitration and collective bargaining shows that the value of these agreements lies in the conciliatory spirit engendered by conferences in which employees and employers meet on a footing of friendly equality. This arbitrator or umpire, with decisive vote, is relatively unimportant. The reason for this statement lies in the important difference between the adoption of new contracts and the interpretation of existing contracts. The latter function is judicial and may safely be left to authoritative arbiters. On the other hand, the adoption of new principles, or the determination of future conditions, is a matter of competitive struggle, which, except on extraordinary occasions, should not be left to outside parties, however disinterested. Recognizing this truth, trade-union leaders generally oppose compulsory arbitration; and even in collective bargaining arbitration seems to be going out of favor both in England and the United States. In the printing (newspaper) and general foundry trades agreements for arbitration exist, but none of the national systems of collective bargaining in the United States contain a provision for arbitration in case representatives of employers and employees fail to agree.

Collective bargaining is somewhat dependent upon the organization of employers, and it increases in extent and efficiency as employers' organizations increase. Associations of employers are not new, but in the last few years they have become not only more numerous than in the past, but more systematic and more thoroughly managed. (See TRADE ASSOCIATIONS.) Most of the existing manufacturers' associations, like the Stove Founders' National Defense Association and the National Association of Builders, encourage collective bargaining and thus make for industrial peace. A large majority of American unions officially indorse arbitration and conciliation. In Great Britain Mr. and Mrs. Webb think that the opposition to arbitration in the strict sense is steadily growing. In the United States opinion is divided, and it is impossible to say whether opposition is increasing or decreasing. It is, however, indisputable that the employees far more frequently invoke the aid of State boards of arbitration than the employers, and that they are practically undivided in support of collective bargaining on the one hand and in opposition to compulsory arbitration on the other hand.

Strikes. Trade-union regulations respecting strikes (see STRIKES AND LOCKOUTS) are so diverse that it is impossible to describe them in a few sentences. Generally speaking, the local union is the active agent in the strike; the national organizations in which a local may be forced to strike against its will number probably less than a dozen, and in only three or four may a local be expelled for striking against the decision of the national officers. The control of the locals is through the purse. Many unions maintain protective funds, or war chests, which in well-managed organizations assume very respectable proportions. If the local desires strike pay and other financial support, it must refrain from striking except in accordance with established regulations of the union. In the better organized unions a procedure like the following is imposed upon locals: Before the strike may be considered a local grievance committee, or the local president or business agent, must attempt to settle the grievance amicably with the employer in question. If this fails, the local may then vote upon the question of striking, and this ballot is usually secret, while in most unions a two-thirds vote is required to authorize the strike. If the local indorses the strike, the decision must be ratified by the national president or executive board, and at this point, again, most unions require the national president to proceed to the scene immediately and make every effort to adjust the grievance by peaceable negotiation with the employer. Only after the failure of this attempt may the national sanction be conferred upon the strike.

The effect of such regulations can be easily appreciated. The strike of the past was sporadic, passionate, and directed against some abuse which the workers believed intolerable. The strike of the present day is deliberately and systematically conducted; it marks the rising market and periods of prosperity; with many trade-unions it has become a settled policy. It is not intended to suggest that trade-unions encourage strikes; the general opinion of economic writers is to the contrary. What is meant is that the strike as conducted by the trade-union is governed by interest and not by passion; and that "while the most intelligent and conservative labor leaders freely recognize the expensiveness of strikes and desire to supplant them as far as possible with peaceable methods of negotiation, they almost uniformly maintain that workingmen gain in the long run far more than they lose by the general policy of striking." For the statistics of strikes, see STRIKES AND LOCKOUTS.

Boycotts. The American union has done with the boycott what it has done with the strike—made it less violent, but more deliberate and systematic. The old form of boycott—the fiery crusade for the social and commercial ostracism of the offending employer—is still met with occasionally, but the favorite method at present is to place the recalcitrant employer on an unfair list and spread the ban through the medium of the labor press. The initiative is largely taken by complaint of the local union to the national executive board that some employer is violating union rules. The national officers usually offer the employer a hearing at which to disprove the charges, or offer proof of intention to discontinue the objectionable practice, and if such proof is not supplied the offender is placed on the list of merchants or manufacturers with whom loyal trade-unionists are encouraged to have no business dealings either as purchasers of commodities or sellers of labor. A majority of American unions use this system to a greater or less extent. The Federation of Labor gives national scope to the more important boycotts by indorsing them and including the offenders' names in the column of the *American Federationist*. It is clear that if the 1,465,800 or more members of the Federation strictly observed every official boycott the latter would become a formidable weapon against manufacturers and sellers of commodities in general use among the laboring classes. The observance, however, is so lax that the boycott is not effective except in a few industries, such as the brewing industry, and in some union strongholds, such as Chicago, Milwaukee, and the larger cities generally.

The question of the legality of boycotts has long been a matter of controversy in the American courts. In the Danbury Hatters' case in 1915 the Supreme Court of the United States held that a boycott conducted by a trade-union against a firm whose products are sold in any State other than that in which they are manufactured, constitutes a combination in restraint of trade and is in violation of the Sherman Anti-trust Act. While this case was in the courts, in 1914, the Clayton Act was passed, including a clause which expressly declares that boycotts are not in violation of any law of the United States.

Finally, trade-unions exert what is often called "a legal boycott" through the familiar union label, which has played such an important part in the building up of the Cigarmakers', Garment Workers', and Hatters' unions in America, and the use of which is now spreading, not only among American unions, but among those of England, Germany, Austria, and Australia. See UNION LABEL.

Bibliography. Sidney and Beatrice Webb, *History of Trade Unionism* (new ed., London, 1911), containing an exhaustive bibliography; Adams and Sumner, *Labor Problems* (New York, 1905); R. T. Ely, *The Labor Movement in America* (new ed., ib., 1905); Hollander and Barnett, *Studies in American Trade Unionism* (ib., 1906); Samuel Gompers, *Labor in Europe and America* (ib., 1910); F. T. Carlton, *History and Problems of Organized Labor* (Boston, 1911); E. D. Bullock (comp.), *Selected Articles on Trade-Unionism* (White Plains, N. Y., 1913); Helen Marot, *American Labor Unions* (New York, 1914); Louis Levine, *Syndicalism in France* (2d ed., ib., 1914); also *Annual Reports of the Industrial Commission* (Washington, 1885 et seq.); *Bulletins of the United States Bureau of Labor* (ib., bimonthly); *Report of the Royal Commission on Labor* (London, annually); *Reports of the Massachusetts Bureau of Statistics of Labor* (Boston); *Annual Reports of the New York Bureau of Labor Statistics*, and monthly journals published by various trade-unions.

TRADE-UNIONS, THE GENERAL FEDERATION OF. The central labor organization of Great Britain. It was organized July 1, 1899, under the auspices of the British Trade-Union Congress for the purposes of upholding "the rights of combination of labor," promoting industrial peace, and establishing a fund for mutual assistance and support. The Federation is "open to every bona-fide trade-union in Great Britain," but the unit of membership is the trade-union and "no branches or individuals are allowed to join." It is governed by a general council of delegates which meets annually, and between these sessions by a management committee of 15. Appeals may be taken from the decisions of both the council and the committee to the general membership. The Federation is "nonpolitical and nonlegislative," leaving to the Labor Representation Committee (see Labor Party, British) the campaign for the election of labor representatives to Parliament, and to the Parliament committee of the Trade-Union Congress the agitation for favorable labor laws. The Federation pays, in strikes authorized by the general council or the management committee, two grades of strike benefits—five shillings a week per member "on the higher scale" and half this amount "on the lower scale." Unions on the higher scale contribute sixpence a member per quarter, and unions on the lower scale threepence a member per quarter, on 90 per cent of the total membership, exclusive of superannuated members. In cases of emergency the management committee is authorized to increase the regular dues 100 per cent. The entrance fee is one penny per member upon 90 per cent of the total membership, but in addition it is provided that "Any society desirous of joining the Federation shall pay ten per cent of the average worth per member of the class or scale the union or society is joining, in addition to their entrance fee, but any society not in existence at the time of adoption of this scheme shall be allowed to join on payment of five per cent of the average worth per member of the Federation at the time of joining." No union is entitled to benefits until it has belonged to the Federation for 12 months. The Federation started with 343,000 members. In 1910 the membership was 709,564.

TRADE WINDS. See Wind.

TRADING STAMPS. Slips of engraved or printed paper, usually in the form of gummed stamps, which are given by merchants to purchasers of goods and which may be presented to some person or corporation in exchange for articles of value. The purchasers of goods are generally given books in which the stamps are pasted until a sufficient number have accumulated for redemption. The advertising advantages of this scheme have made it very profitable, and one method of obtaining the desired publicity is the printing of books containing the names of all subscribers and distributing these books among the residents of the surrounding country or district.

Although frequently attacked as constituting a contract void against public policy, because of the element of chance involved, the courts have uniformly upheld such contracts. In certain specific instances, however, as when stamps containing certain numbers, the obtaining of which depends upon mere chance, are more valuable than others, the scheme constitutes a violation of the statutes against the maintenance of lotteries. Because of the claim that the trading-stamp business is demoralizing in that it fosters a desire in the public to get something for nothing and that it tends to maintain the gambling spirit, statutes were passed in many States prohibiting the distribution of such stamps. It was contended also that the scheme was objectionable because many people who received stamps failed to present them for the premium offered, and that in any event the dealer distributing the stamps was bound to reduce the quality of his wares or increase the price. These statutes, however, have, with a few slight exceptions depending upon the peculiar wording of the particular statute, been held to be unconstitutional as an improper exercise of the police power and a taking of property without due process of law. Such was the fate of such legislation in New York and New Hampshire. See Lottery.

TRADU'CIANISM (from Lat. *traducianus*, from *tradux*, vine branch for propagation, from *traduoer*, to lead along, train, propagate, from *trans*, across, through + *ducere*, to lead). One of the theories adopted for the purpose of explaining the production of the soul in the procreation of human species. It is ascribed to Tertullian (q.v.) as its first author and is elaborately explained and defended by him in his book *On the Soul*, written after he had lapsed into the Montanist heresy. In opposition to others who had held the theory of preëxistence of souls, Tertullian taught that souls, like bodies, are propagated from one generation to the next. In another place he describes this origin of soul from soul as generation, and even of a class analogous to corporeal generation; and this more gross and material exposition of the theory of traducianism is sometimes called generationism, which, however, is commonly looked upon as a totally distinct theory. A third hypothesis to explain the origin of the soul is that of creationism (q.v.).

TRAETTA, trä-ĕt'tȧ, Tommaso (1727–79). An Italian composer, born at Bitonto. He studied at the Conservatorio di Loreto, Naples (1738–48), and in 1751 produced his first opera, *Farnace*, in Naples. From 1765 to 1768 he was a director of a conservatory in Venice and resigned to become court composer to Catharine II at St. Petersburg. Of his 40 operas perhaps the most important is *Ippolito ed Aricia* (1759), which gained for its composer a life pension from the King of Spain. His works were characterized by theatrical effectiveness and harmonic vigor. Consult V. Capruzzi, *Traetta e la musica* (Naples, 1878).

TRAFALGAR', *or, more commonly in England*, trȧ-făl'gẽr, Cape. A low promontory on the south coast of Spain, about 29 miles southwest of Tarifa (q.v.), at the western entrance to the Strait of Gibraltar. It is memorable for the great naval victory obtained off its shores by the British fleet under Nelson over the combined fleets of France and Spain on Oct. 21, 1805. The allies had 33 ships, commanded by the French vice admiral, Villeneuve, while Nelson had 27. The British fleet was arranged in two columns. The first under Collingwood fell upon the rear of the allied fleet, commanded by the Spanish vice admiral, Gravina. After a terrible contest, in which Nelson himself lost his life, the two British columns completely disorganized the hostile line. Eighteen ships were captured, and Napoleon's naval power was gone forever. For the influence this victory had on the course of the Napoleonic wars, see Nelson, Horatio; Napoleon I. Consult Edward Fraser, *The Enemy at Trafalgar* (London, 1906).

TRAFALGAR SQUARE. A London square named from the battle of Trafalgar and containing the imposing granite column in memory of Nelson and statues of Havelock, Napier, Gordon, and George IV. About it are many public buildings.

TRAFFIC AND TRAFFIC PROBLEMS. See Railways.

TRAF'TON, Mark (1810–1901). An American Methodist Episcopal minister, born in Bangor, Me. He joined the Maine conference in 1831, but held most of his charges in the New England and Providence conferences. In 1855, while serving as pastor at Westfield, Mass., he was elected to represent his district in the Thirty-fourth Congress. He was known as a poet also. He published: *A Plea for Infant Baptism and against Exclusive Immersion* (1846); *Rambles in Europe* (1852); *The Safe Investment* (1856); *Baptism, Subjects and Modes* (1870); *Scenes in my Life* (1877).

TRAG'ACANTH. See Gums.

TRAGEDY. See Drama.

TRAGIC POET, House of the. One of the most attractive houses of Pompeii, made famous as the home of Glaucus in Bulwer's *Last Days of Pompeii.* The name was assigned through misconception of a painting discovered at the time of the excavation. It had two stories and was richly decorated with paintings, among them, "The Nuptials of Zeus and Hera" and "The Sending Away of Briseis," both preserved in the Naples Museum, together with the noted mosaic of a dog with the motto "Cave Canem," originally in the floor of the vestibule. Consult August Mau, *Pompeii: Its Life and Art* (Eng. trans. by F. W. Kelsey, 2d ed., New York, 1902).

TRAG'OPAN (Neo-Lat., from Gk. *τραγός, tragos,* goat + *Πάν, Pan,* Pan), or Horned Pheasant. One of the pheasant-like birds of the genus *Tragopan,* which have naked cheeks, a hornlike caruncle projecting backward from behind each eye, and a loose wattle, capable of being inflated, hanging beneath the bill. Five species are known, all found in India and China. They are brilliantly colored, live high up among the mountains, and are probably the only members of their family which nest in trees. See Horned Pheasant.

TRAILING ARBUTUS. See Arbutus, Trailing.

TRAILL, trāl, Catherine Parr. A sister of Agnes Strickland (q.v.).

TRAILL, Henry Duff (1842–1900). An English journalist and author, born at Blackheath, near London. He was educated at the Merchant Taylors' School, London, and at St. John's College, Oxford. In 1869 he was called to the bar at the Inner Temple, but he soon gave up law for journalism. He edited the *Observer* from 1889 to 1891 and was the projector and first editor of *Literature* (established 1897). Traill did much miscellaneous work of good quality. For the "English Men of Letters Series" he wrote *Sterne* (1882) and *Coleridge* (1884); for "English Worthies," *Shaftesbury* (1886); for "English Statesmen," *William III* (1888); and for "English Men of Action" *Strafford* (1889). Other biographies by him are *Lord Salisbury* (1891), *Sir John Franklin* (1896), and *Lord Cromer* (1897). In politics and history notable works of his are: *Central Government* (1881); the exhaustive *Social England* (1892–1904), of which he was editor; *From Cairo to the Soudan Frontier* (1896); *England, Egypt, and the Soudan* (posthumous, 1900). *The New Lucian* (1884), *Number Twenty* (1892), and *The New Fiction and Other Essays* (1897) represent him at his best as a satirist and as a commentator on life whose humor is strongly tinctured with melancholy. Political verse contributed to various periodicals was collected under the titles *Recaptured Rhymes* (1882) and *Saturday Songs* (from the *Saturday Review,* 1890).

TRAIN, George Francis (1829–1904). An American author, born in Boston, Mass. After engaging in the mercantile business in Boston and Australia he went to England in 1860 and undertook to form street-railway companies in Birkenhead and London, but his plans were obstructed by legal opposition. His publications include: *An American Merchant in Europe, Asia, and Australia* (1851); *Young America Abroad* (1857); *Irish Independency* (1865); *Championship of Women* (1868). He also published an autobiography entitled *My Life in Many States and in Foreign Lands* (1902).

TRAIN BANDS. Early English militia raised by commissions of musters and organized and drilled as military bodies. On the abolition of the fyrd in 1604, James I organized in its place the train bands to the number of nearly 200,000 men. As an organization the train bands were neither militia nor volunteers, but partook of the nature of both and in point of efficiency lacked both discipline and drill. During the Civil War they sided almost to a unit with the Parliamentarians and rendered very effective service. After the Restoration the command and control of the army were definitely assigned to the King; before this time the question had been in doubt. The term is also found in connection with forces of militia in the early American Colonies.

TRAIN DISPATCHING. See Railways.

TRAINED NURSES. See Nurses, Training of.

TRAINING. See Physical Education.

TRAIN STOP, Automatic. See Block-Signal System.

TRA'JAN (Marcus Ulpius Traianus) (51–117 a.d.). A Roman Emperor (98–117), born at Italica, near Seville, in Spain. He was descended from a family which was probably of Roman origin and was early trained to arms, becoming a leader in the Parthian and German campaigns during the reigns of Titus and Domitian. He was prætor (85) and consul (91) and was adopted (97) by Nerva (q.v.) as his colleague and successor. Trajan celebrated his accession, in January, 98, by largesses to the soldiers and to Roman citizens and their children. He also made provision out of the Imperial treasury for the maintenance of the children of poor freemen in Rome and other Italian towns. In 101 Trajan set out on his first campaign against the Dacians, who had exacted tribute from Rome since Domitian's time. The struggle was long and destructive, but the Romans at last gained a decisive superiority and in a subsequent campaign (104–105) completely subdued their opponents, whose country thenceforth became the Roman province of Dacia and was secured by partial colonization. This conquest, the first since the death of Augustus, was celebrated, on Trajan's return to Rome, by a triumph and by games on a most extensive scale, which continued for four months. The Column of Trajan was erected to commemorate this victory. In 106 Trajan again went to the East. Landing in Syria, he marched northward, receiving on his way the submission of numerous princes, and conquered Armenia, which he made a province. The record of the events of the next seven years of Trajan's reign is extremely defective, the few notices in Dio Cassius and others being insufficient for the construction of a consecutive narrative. In 115 he again set out from Syria, directing his march this time against the Parthian Empire. He took Ctesiphon almost without a struggle and, descending the Tigris, subdued the tribes on both banks, being the first and only Roman general who navigated the Persian Gulf. On his return he found that Mesopotamia, north Syria, and Arabia required to be subdued again. This being done, and Parthia again conquered, Trajan attempted to reach Italy, but died at Selinus in Cilicia.

Though most of Trajan's reign was spent in the gratification of his warlike ambition, internal affairs were not neglected; the administration of justice was vigorous and impartial; that of finance was equally acceptable; informers (*delatores*) were severely punished, and peculating governors of provinces rigorously prosecuted. The improvement and beautifying of Rome were carried on; the Empire was traversed in all directions by new military routes, canals and bridges were constructed, new towns built, the Via Appia was restored, the magnificent Forum Traiani erected, and the harbor of Centum Cellæ (Civitavecchia) constructed. During Trajan's reign a mild persecution of the Christians took place. Consult: Johannes Dierauer, *Beiträge zu eine kritischen Geschichte Trajans* (Leipzig, 1868); Schiller, *Geschichte der römischen Kaiserzeit* (Gotha, 1883); and the article "Ulpius, 8," in Friedrich Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

TRAJAN, Arch of. 1. An arch at Benevento, Italy, somewhat resembling the Arch of Titus at Rome, erected in 114 A.D. to commemorate the completion by Trajan of a new road to Brundisium. It is of white marble with one archway 27 feet high, the whole structure being 50 feet in height. The reliefs represent the triumphs of Trajan over the Dacians. The arch is one of the finest and best-preserved specimens of the Roman arch. 2. A triumphal arch, in good preservation, at Ancona, Italy, built by the Roman Senate in 112 A.D. It commemorates the building of new quays by Trajan. The single archway is 29 by 46 feet. 3. An arch at Timgad (q.v.).

TRAJAN, Baths of. Baths built by Trajan on portions of the remains of the Golden House of Nero in Rome (Thermæ Trajanæ). The scanty ruins are situated on the Appian Way, where some remains may be seen in the Villa Field. They adjoin the Baths of Titus (q.v.), with which they were confused until 1895, on the northeast. The materials of the magnificent edifice were used in limekilns and in constructing other buildings. Consult S. B. Platner, *The Topography and Monuments of Ancient Rome* (2d ed., Boston, 1911).

TRAJAN, Forum of. An immense group of public buildings in ancient Rome, filling the space between the Capitoline and Quirinal hills. It was named after its principal builder, the Emperor Trajan, and included the Forum proper, entered by the famous Arch of Trajan and containing his equestrian statue in bronze; the Basilica Ulpia; the celebrated Column of Trajan, in the midst of a cloistered court, where were also located the two Ulpian libraries, one Greek, the other Latin; and the Temple of Trajan, built by Hadrian. See Forum.

TRAJAN'S COLUMN. A celebrated column at Rome, erected 114 A.D., near the centre of the Forum of Trajan, ostensibly by the Roman Senate and people, in honor of the Emperor Trajan. The pedestal is covered with sculptured trophies of Dacian arms, and a very remarkable series of bas-reliefs, forming a spiral round the shaft, 3–4 feet wide and 660 feet long, exhibits a continuous history of the military achievements of Trajan in his Dacian wars. These are in excellent preservation and, independently of their beauty as works of art, are invaluable as records of ancient costume, military operations, and history. A spiral staircase in the interior of the column leads to its summit. The column proper is of the Roman Doric or, rather, Tuscan order; its height, including base, shaft, and capital, but excluding the lofty pedestal (18 feet), is just 100 Roman feet (29.57 meters). The tradition that its total height of 147 feet above the pavement marked the height of the hill removed to level the site of the Forum is now generally discredited. The summit was crowned by a colossal statue of the Emperor, which was incongruously replaced (by Pope Sixtus V in 1588) by one of St. Peter. The ashes of Trajan, who died in the East, were said to have been deposited under this column in a golden vase, but no traces of such a burial have been found, though a few years ago a chamber was found in the base in which the ashes may once have been deposited. Consult: C. E. Fröhner, *La colonne Trajane* (4 vols., Paris, 1872–74); Salomon Reinach, *La colonne Trajane au musée de Saint-Germain* (ib., 1886); Conrad Cichorius, *Die Reliefs der Trajanssäule* (2 vols., Berlin, 1896–1900); E. Petersen, *Trajans dakische Kriege* (Leipzig, 1899); S. B. Platner, *The Monuments and Topography of Ancient Rome* (2d ed., Boston, 1911).

TRAJAN'S WALL. A line of fortifications stretching across the Dobrudja from Czernavoda, where the Danube bends northward, to a point of the Black Sea coast near Kustendje. It consists of a double and in some places a triple line of ramparts of earth (8¾–11 feet in height on the average, though occasionally it attains an altitude of 19½ feet), bounded along its north side by a valley which, being generally marshy, serves admirably the purpose of a ditch. The construction of this rampart is attributed to Trajan, the general of the Emperor Valens, who in 377 A.D. endeavored by this means to check the advance of the Visigoths. In 1854 Trajan's wall became an important line of defense on the invasion of the Dobrudja by the Russians, and the invaders were twice defeated in their attempts to pass it—at Kostelli (April 10) and Czernavoda (April 20–22).

TRAJEC'TORY (from Lat. *trajicere, transjicere*, to throw across, from *trans*, across, through + *jacere*, to throw). In mathematics, any plane curve which cuts at a constant angle a series of plane curves of the same species having a common origin. If the constant angle is a right angle, the curve is called an orthogonal trajectory of the system. The question of such a curve was proposed by Johann Bernoulli (1691) in his *Acta Eruditorum*, and Newton (1716) laid the foundation for the theory of trajectories. Consult, for the history of the trajectory, Terquem, in the *Nouvelles annales de mathématiques* (Paris, 1845); for the various classes, Brocard, *Notes de bibliographie des courbes géométriques* (Bar-le-Duc, 1897, and supplement, 1899). See Gunnery.

TRAJECTORY, in Gunnery. See Ballistics.

TRALEE′. A seaport of Ireland, the chief town of County Kerry, on the Lee, 1 mile from its mouth and 207 miles west-southwest of Dublin (Map: Ireland, B 7). The town is well built and dates from the twelfth century. Pop., 1901, 9867; 1911, 10,300.

TRALLES, trăl′lēz. An ancient city of Lydia in Asia Minor, on the Eudon River, a northern branch of the Mæander. Its origin was ascribed to Argive and Thracian settlers. It was a thriving commercial centre. Under the Seleucidæ it was known as Seleucia and Antiochia.

TRAM. See SILK.

TRAMP. The American equivalent of the English "sturdy beggar" and "vagrant." His first statutory appearance was in 1876 in New Jersey, and he was soon recognized legally in 21 States. He is commonly defined as an able-bodied man without visible means of support, wandering aimlessly, begging, and refusing work, camping and kindling fires on highways and private property, and terrorizing women and children. What really distinguishes him from the prosaic vagrant of other countries is his extensive use of the railways—stealing rides, or, in his argot, "jumping trains." From 1901 to 1905 inclusive 23,964 "trespassers" were killed and 25,236 injured by railroads in the United States, or more than the combined numbers for passengers and trainmen. From one-half to three-fourths of these trespassers are tramps.

The great difficulty with the train-jumping tramp is that local authorities do not like to bear the expense of prosecutions and maintenance in jail. The common custom is for the authorities to put the tramp back on the next train or give him 24 hours to leave town. By this method each town naturally receives as many as it gets rid of. Action by a unit at least as broad as the State is absolutely necessary. In 1895 Massachusetts showed a mean daily tramp population of 791, as against 451.4 in 1890, implying a total for the State of 2832, as against 1616 before, and of 79,427 for the United States. The mean was lower, with but two slight intermissions, afterward, and in 1902–03 was 369.6, suggesting 1323 for Massachusetts and 38,636 for the United States. In 1905 Massachusetts passed an effective vagrancy law, and conditions in that State ceased to be indicative for the country as a whole. The effects are shown by the numbers of tramps sheltered in almshouses in the State in the successive years. In 1905 there were 23,341; 1906, 7200; 1907, 3127; 1908, 423; 1909, 272; 1914, 131. Unfortunately no general decrease in vagrancy is indicated, as they were merely driven to other States. In 1915 the problem was most acute in New York City, which has the reputation of being "the best town for bums in the United States." The average cost of the tramp to the community is about $4.40 a week, independent of his possible depredations; and although 83.5 per cent of tramps say their health is good, 10 per cent of them admit having had a dangerous contagious disease.

There are no national repressive laws. Those of the various States have been characterized by a severity born of panic, a penalty sometimes being 12 months' imprisonment, and in two States sale at public auction for a designated period. Contrary to the common impression, the tramp generally has learned and frequently practiced a trade or profession, about one-half having this ability. The proportion of professionals, or those who never work, is small, their real weakness being chronic tendency to intermittency in work. This is fostered by their habits and marital condition, 63 per cent being admitted drunkards and 93 per cent unmarried; and again by the conditions of industrial activity, the drunkard being employed only when he is indispensable, and discharged, along with the unmarried man, when business slackens—witness the great rise in tramp population after 1873 and the fall after 1901. Statistics seem to show that the surest way of correction lies in prevention.

In England the ancient penalties against what we call tramping were very severe. Under Edward VI the punishment was branding on the breast with a V and two years' slavery. In 1572 it was whipping for the first offense, boring the ear with a hot iron for the second, and death for the third. A fine of 10 times the dole was imposed on the person helping the vagrant. The vagrant may now be lodged in the casual ward of the Union (almshouse), where he must break stone or pick tow in payment. The alarming increase in the evil in England led the President of the Local Government Board in 1904 to appoint a departmental committee on vagrancy. In its report in 1906 this committee recommended much more stringent treatment and the introduction of the Swiss and German travel-card system to distinguish vagrants from honest work seekers.

In Germany the most drastic modern measure against the prime vice of tramping, open mendicancy, was that taken in Bavaria in 1790–95, under Count Rumford, where in four years 10,000 vagabonds were arrested. It proved effective. The number of tramps in Germany is unknown, but has been set at 100,000. The tramp there is the lineal descendant of the old artisan wandering abroad to complete his knowledge of his craft. Beginning in 1854, when Professor Perthes, of Bonn, founded a cheap tavern for them, where no drink stronger than beer could be had, the number of these home refuges (*Herbergen zur Heimat*) increased in 1901–02 to 462, a gain of 72 from 1892 to 1902, with an aggregate of paying guests for the year of 1,931,575 and of nonpaying guests or those rendering an equivalent in work of 759,057. For 108,505 of these situations were found. In 1910 the number was 449, according to the statistics of the association (*Deutschen Herbergs Verein*) into which they had been organized in 1886. Three new ones were opened and nine closed during the year. Of these 217 were connected with *Verpflegungstationen* or *Wanderarbeitsstätten*. The number sheltered during the year was 2,726,850, aggregating 4,727,297 nights' lodgings (as against 2,622,000 and 4,547,028 the previous year). Employment was found for 133,899, a decrease of 5189 compared with the previous year. In more or less direct communication with the *Herbergen*, in 240 instances under the same roof, is, on the one hand, a great network of local establishments (*Verpflegungstationen*) where lodging and a meal is furnished in exchange for work, generally wood-chopping; or, if there is no separate building, an order is given for cheap entertainment at a local tavern.

On the other hand is a chain of labor colonies (*Arbeiterkolonien*), the first of which was established in 1882 at Wilhelmsdorf in Westphalia by

Pastor von Bodelschwingh. The number in 1910 was 34 in Germany, with an additional one for Germans in England at Libury Hall, near London. Twenty-six were established between 1882 and 1892, a decade of especial industrial depression. During the year 1910, 12,303 persons were admitted (against 12,878 for 1909) and 12,445 dismissed. The total number admitted from the beginning was 226,935, and the capacity of the existing colonies 4888. It is interesting to note that, of the 12,303 admitted, 4742 came for the first time and 2548 for the second, while 1342 had been over seven times in a colony; 9467 had never been married, and only 513 were married at the time of admission. Of those dismissed, about exactly half (6324) left "at their own request," situations were found by the colonies for 911 and by the occupant himself in 1295 cases. The rest were mainly discharged for misdemeanors of various sorts or ran away or were turned over to the poor-relief authorities or hospitals; 37 died. Of recent years public action dealing with vagrancy has been growing in Germany. A Prussian Law of June 29, 1907, empowers the Diet (Landtag) of any province to compel communal and municipal authorities to establish wayfarers' lodges (*Wanderarbeitsstätte*), and Westphalia has since put in operation a complete system. The best example of what may be done is afforded by the Kingdom of Württemberg, where a quasi-public Society for the Promotion of Wanderarbeitsstätten in Württemberg, assisted by fiscal appropriations, maintains a chain of 27 institutions (close of 1909). During the year October, 1909, to September, 1910, 82,212 migratory workers were admitted to the lodges. The cost to the state of a day's entertainment is about one mark (25 cents) against an estimated average intake of from two to three times as much when they are permitted to beg. The system reduced court sentences for begging and vagrancy by 78.5 per cent the first year. Three labor colonies with a capacity of 150 are an adjunct of the system. Every applicant received must have a travel card (*Wanderschein*), to be obtained on establishment of identity and proof of a clear police record and of having been employed or prevented from work by sickness during the preceding three months. A day's entertainment is given for four hours' work. After the midday meal the wanderer must, if no suitable work can be furnished him, proceed to the next *Arbeitsstatt*, the time of arrival and departure being punched on the *Wanderschein*.

The Swiss labor colonies have attracted particular notice in the United States. They are compulsory and under the supervision of the cantonal authorities; there is one in each canton, that at Wytzwyl being the largest and most successful. They have nearly eliminated vagrancy from Switzerland. Partly as a result of Mr. Edmond Kelly's book on "The Elimination of the Tramp" (1908), the New York Legislatures of 1911 and 1912 passed bills establishing a tramp farm along the Swiss lines in the State. Land was purchased, but owing to insufficient appropriations the work has not been carried to completion (1913). Massachusetts has a tramp farm.

Labor colonies are also more or less successful in Holland and Belgium, and the French have experimented, under Paris municipal patronage, along the same lines, at La Chalmelle in the Department of Marne.

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TRANCE (OF., Fr. *transe*, extreme fear, Sp., Portug. *trance*, crisis, hour of death, from Lat. *transitus*, passage over, from *transire*, to pass over, cross, from *trans*, across, through + *ire*, to go). A general term in psychology denoting various forms of modified consciousness. The psychological symptoms vary from seeming inanimation to a waking condition, though a manifestly abnormal one, of exaggerated suggestibility in respect to some dominating idea. In general there is more or less marked anæsthesia. What may be termed the waking trance is also characterized by extraordinary concentration or automatic mental action, while the ordinary functions of the body are little interrupted. The thoughts of the subject are ordinarily fixed on one kind of idea, frequently religion. In trance sleep, except in its protractedness and the lessened sensibility to external stimuli, there appears to be little that is abnormal. In trance coma these symptoms are more intense, and respiration and circulation are feebler. In death trance, except sometimes the inner dream life, all animation ceases, including the action of heart and lungs. The thought, or dream, of trance is likely to be more sequential and coherent in character than that of normal sleep. Various pathological and psychopathic conditions are often called trance, such as deep and unusually protracted sleep, lethargy, suspended animation, the hypnotic state, and altered personality. Consult: J. M. Charcot, *Lectures on the Diseases of the Nervous System* (London, 1877–89); G. J. Preston, *Hysteria and Certain Allied Conditions* (Philadelphia, 1897); Frank Podmore, *Modern Spiritualism* (2 vols., London, 1902); Morton Prince, *Dissociation of a Personality* (2d ed., New York, 1908); J. H. Hyslop, *Psychical Research and Survival* (London, 1913). See SOMNAMBULISM.

TRANI, trä'nē. A seaport in the Province of Bari delle Puglie, Italy, 27 miles by rail northwest of Bari (Map: Italy, F 4). Its ancient walls have given place to spacious boulevards. The twelfth-century cathedral has a very high tower and magnificent bronze doors. The Santa Maria Immaculata is a beautiful church. The Gothic palace (the seat of a priests' seminary) and the old castle (now a prison) are both interesting. Excellent building stone is quarried. Trani first came into notice when it submitted to the Normans in 1073. During the Crusades it carried on a heavy trade with the Levant. Pop. (commune), 1901, 31,800; 1911, 32,059.

TRANSBAIKALIA, trăns'bī-kä'lē-ȧ. A province of eastern Siberia (Map: Asia, N 3).

Area, 238,308 square miles. The province is divided by the Yablonoi Mountains, a part of the Stanovoi (q.v.) chain, into two parts, of which the western has the character of an elevated plateau intersected by a deep valley that extends from Lake Baikal to the Uda River and is used by the chief highways as well as by the Trans-Siberian Railway. The portion east of the Yablonoi chain is lower than the western part and is traversed in the southeast by the Nerchinsk Mountains. The region is watered by the Argun and Shilka, which unite to form the Amur, by the Vitim, a tributary of the Lena, and by the Selenga (q.v.), a tributary of Lake Baikal. Of the numerous lakes the principal is Baikal (q.v.). The climate is continental, dry, and very severe, the temperature being occasionally as low as —58°. The snowfall is slight. Transbaikalia is one of the most highly mineralized regions of Siberia. Gold is found especially in the Nerchinsk Mountains, where there are also rich deposits of silver and lead. Coal is found near the southeastern shore of Lake Baikal, and iron in many parts. The mining industry, however, is not highly developed, and only the gold output is important. The mines are owned to a large extent by the state and worked by convict labor, the centre of the mining industries being the Nerchinsk region. Agriculture is confined chiefly to the south, where the natural conditions are more favorable. Stock raising is extensively carried on, and hunting is still of considerable importance. The chief manufactures are leather, spirits, and flour. The transit trade with Mongolia through Kiakhta (q.v.) is large. Estimated population at the beginning of 1914, 945,700, of which the town population was 144,300. The Russian population is largely in the Nerchinsk mining region. Prosperous settlements of Raskolniks are in the Chikoi, Khilok, Uda, and other valleys. There are many Cossacks, largely Mongolian in character. The aboriginals, mostly Buryats (about 180,000) and Tunguses (about 30,000), have still in the main preserved their clan organization, although many of them have been assimilated with the Russians. Capital, Tchita (q.v.).

TRANSCAS'PIA. A Russian province in west Asia (Map: Asia, G 4). Its area is 235,120 square miles. In its general features the region resembles Turkestan, of which it may be considered a western continuation. The larger part of the north consists of elevated table-lands with some mountains in the peninsula of Manghishlak in the northwest and a deep depression near the Khivan frontier in the east. The central part is lower and is practically a desert with shifting sands and dried-up river courses. The southern part is traversed by a mountain chain which separates the sandy deserts of Turcomania from the highlands of north Persia and from its structure and direction appears to be a continuation of the Caucasus system. This region is watered by the Atrek, which flows along the southern boundary to the Caspian and by the Tejend and the Murghab. As a whole, Transcaspia is scantily watered. Irrigation is practiced. The coast is indented by a number of deep inlets, of which that of Kara Bugas is noted for its extreme salinity. The climate is hot and dry, and the precipitation extremely meagre. The region contains rich mineral deposits, of which salt, naphtha, ozocerite, and gypsum are mined to some extent. Agriculture is developing in the southern part, which is more favorably situated with regard to irrigation. The principal products are wheat, sorghum, rice, and barley. Cotton is also successfully cultivated. The natives have extensive herds of sheep and other stock and export skins and wool. A number of household industries, such as rug weaving and the production of various articles of felt, are more or less developed. The chief medium of transportation is the Transcaspian Railway, which traverses the southern part of the territory. Pop., 1912, 486,200, of whom the Turcomans constituted about two-thirds. Capital, Askhabad (q.v.).

TRANS'CAUCA'SIA. The southern part of the Caucasus (q.v.), comprising six governments, three provinces, and two districts of Russia (Map: Asia, F 4). Area, about 95,405 square miles. It was the scene of severe fighting between the Russians and the Turks during the Great War. (See WAR IN EUROPE.) Pop., 1912, 6,931,900.

TRAN'SCENDEN'TAL, TRAN'SCEND'ENT (from *transcendent*, from Lat. *transcendens*, pres. p. of Lat. *transcendere*, to surpass, from *trans*, across, through + *scandere*, to climb, Skt. *skand*, to spring, ascend). Words employed by various schoolmen, in particular Duns Scotus, to describe the conceptions that by their universality rise above or transcend the 10 Aristotelian categories. (See CATEGORY.) Thus, according to Scotus, *ens*, or being, because it is predicable of substance and accident alike, of God as well as of the world, is raised above these by including or comprehending them.

Between the hitherto convertible terms "transcendental" and "transcendent" Kant drew a distinction, of considerable importance in understanding his own system. By the word "transcendental" he designates the various forms, categories, or ideas assumed to be constitutive or regulative elements of human experience; although they are manifested only in experience, they are not products of experience. Among such transcendental elements are space and time, causality, and substantiality. The knowledge that these elements are not of empirical origin is called transcendental knowledge. The word "transcendent" Kant reserves, but not with uniform consistency, for those objects that lie in the world of things in themselves, entirely inaccessible to experience, and for any pretended knowledge of such objects. See KANT.

TRANSCENDENTAL DEDUCTION. See DEDUCTION.

TRAN'SCENDEN'TALISM. A term applied in philosophy to Kant's system and to those like it in maintaining that there can be knowledge of transcendental elements. (See TRANSCENDENTAL.) The terms Transcendentalism and Transcendental school are now frequently used by English-speaking peoples to designate the views of thinkers like Emerson (see EMERSON, RALPH WALDO) and his colleagues in the Transcendental Club (1836) and at Brook Farm (q.v.). The so-called Transcendental movement was mainly confined to New England, especially to Massachusetts, and in point of time to about 1830–50. In its origin it dates much further back, and in its effects it can scarcely be said to be entirely extinct to-day. In character it was partly philosophical, thus connecting with German and French thought; partly economic, thus connecting with French and English schemes of social reform; partly literary, thus connecting with the poetry of such dissimilar characters as Wordsworth and Shelley and with the gospel of Carlyle; partly theological in a loose sense, thus connecting with Unitarianism; but on the whole, as Emerson averred, primarily spiritual, thus connecting with and finally coalescing in contemporary movements for regeneration of every kind. It may be said that New England Transcendentalism was in the main a result of a revolt from the formalism both of Unitarianism and of Calvinism, and coalesced with a loose system of intuitional philosophy borrowed from Germany and with the Romantic revolt from classicism in literature, as well as with a contemporaneous American movement for securing the benefits of foreign culture, and which finally more or less merged in the great antislavery agitation. It will be necessary to dwell briefly on each element.

Transcendentalism in New England was involved in the great awakening of a century before, for both were spiritual manifestations, the earlier of which did much to shake the hold of rigid Calvinism and to introduce the religious emotionality and liberalism that were later to culminate in men like William Ellery Channing and Theodore Parker (qq.v.). Within 20 years after the awakening Arminianism and Arianism, through the agency of the Deists and other British writers, had made many converts, especially in eastern Massachusetts. Jonathan Mayhew (q.v.) is typical of these early liberals or Unitarians. The followers of Jonathan Edwards struggled valiantly against the innovators and held most of New England for orthodoxy, but by 1785 there was a distinctively Unitarian church (King's Chapel) in Boston, even if 30 years were to elapse before this name could be definitely fastened on the seceders from Calvinism. This change of faith was not effected without heartburning and a development of religious unrest among New Englanders, which made the acceptance of new philosophical ideas, new literary standards, and new social theories all the easier when the time was ripe. The appointment of Unitarian professors at Harvard, resulting in the founding of Andover Theological Seminary (q.v.), and the preaching of such men as the younger Buckminster and Channing, undoubtedly prepared the way for Emerson, Alcott, Ripley, and Parker.

But although by 1825 Unitarianism had won a victory in Boston and its environs, it was not destined to maintain its ascendency for so long a period as its foe, Calvinism, had done. It, too, showed a tendency to formalism, both in thought and in taste, and impressionable souls soon broke away into new paths of philosophy, theology, and literature. Some little knowledge of Kant and his successors, of Schleiermacher, and of Goethe had been obtained by a few persons prior to 1830. Before 1840 the labors of George Ripley, F. H. Hedge (qq.v.), and other translators had considerably increased this knowledge; in consequence the influence of German thought upon New England Transcendentalism cannot be ignored, although it is easily exaggerated. French thought, as illustrated by Cousin and more by Fourier, was less influential, but that there was a decided taste for foreign literature which gave an impetus to the contemporaneous movement for a greater and freer spiritual life seems to be clearly established. This meant dissatisfaction with eighteenth-century standards and with the colonial character of American literature and thus involved the founding of the *Dial* (q.v., 1840–44). Nor in this connection should we forget the interest displayed by some Transcendentalists in the Oriental Scriptures, in Neoplatonism, and in more or less occult literature. But behind the revolt from formal Unitarianism and the craving for new forms of philosophy and literature that characterized many young persons in New England between 1830 and 1840, there was the uplift of the world's spirit that showed itself in many ways, and there was also on the part of aspiring souls a contempt for the vulgarity and selfishness of American political and business life of this epoch. It is no wonder that New England was unable to develop orderly schools of thought and literature and seemed given over to extremists and faddists of all sorts.

In 1836 (September 19) Emerson, Hedge, Alcott, and others formed the so-called Hedge or Transcendental Club. Little came of this organization until the *Dial* was started in 1840 and Brook Farm (q.v.) was founded in 1841. Neither enterprise was fully successful, but both were influential upon literature and thought, though not greatly upon action. Under Margaret Fuller (q.v.) and Emerson the *Dial* was a hospitable receptacle for the verses of the Transcendentalist poets—C. P. Cranch (q.v.), the younger W. E. Channing (q.v.), and others, whose merits are slowly being recognized—and for many of the best papers of the two editors and of Thoreau. (See THOREAU, HENRY D.) It did not create or recreate American literature, but it undoubtedly stimulated important writers. Brook Farm community life was laughed at by the hard-headed and not effectively supported by many of the leading Transcendentalists themselves, but it set up a beneficial ideal of "plain living and high thinking," it furnished Hawthorne material for his *Blithedale Romance*, and it doubtless leavened the utilitarian spirit of the country and the age.

No writer upon New England Transcendentalism has failed to remark upon the exceedingly elusive character of the movement. It is difficult to disengage its elements, to delimit it in point of time, to say what it really accomplished, to determine what it became. If it had been fully organized, the case would have been different for the student, yet the results would probably have been less fortunate, both to the Transcendentalists themselves and to the American people at large. Not being hampered by organization, by formulas, by the apparatus of propagandism, the Transcendentalists were better able to serve a more specific cause of greater moment—that of Abolition. They were also enabled to follow the bent of individual genius after having experienced the stimulating effects of having lived in a period of uplift. Emerson became the favorite moralist of his countrymen and an important poet; Alcott gave full vent to his eccentricity and ended as the patron saint of the Concord Philosophers; Margaret Fuller had a brilliant and only too short career as a critic and woman of letters; Ripley, by his reviews in the *Tribune* and his services with C. A. Dana (q.v.) as an encyclopædist, showed that a Brook Farmer was capable of valuable if homely work in the cause of letters and science; Thoreau revealed nature to his countrymen and became a high priest of individualism as well as a writer of truly classic prose; Theodore Parker died just before the beginning of the crusade of which he was perhaps the greatest preacher. Thousands of men and women throughout New England were inspired by Transcendentalism to devote themselves to every form of philanthropy. The era of the Transcendentalists was in many respects an American Renaissance, the effects of which were not confined to this country, but were spread, chiefly through the writings of Emerson, Thoreau, and Channing, to England and to some extent to the continent of Europe. That their ideas were vague and often transcended reason, not to say common sense, that their literary work was largely amateurish, that their extravagances gave much occasion to legitimate ridicule, that their so-called movement was the forerunner of religious and social manias of all sorts, can scarcely be gainsaid; but it is equally idle to deny the loftiness of their aims and the importance of their works.

Consult: O. B. Frothingham, *Transcendentalism in New England* (New York, 1876); Lindsay Swift, *Brook Farm: Members, Scholars, and Visitors* (ib., 1900); T. W. Higginson, *Old Cambridge* (ib., 1900); G. W. Cooke, *Unitarianism in America* (Boston, 1902); id., *The Poets of Transcendentalism: An Anthology* (ib., 1903); Leighton, *French Philosophers and New England Transcendentalism* (Charlottesville, Va., 1908); H. C. Goddard, *Studies in New England Transcendentalism* (New York, 1908). The last two works contain bibliographies.

TRANSCENDENTAL NUMBERS. See Number.

TRANSCONTINENTAL RAILWAYS. See Canada; Siberia; United States, *Transportation.*

TRANSCRIP'TION (Lat. *transcriptio*, from *transcribere*, to transcribe, from *trans*, across, through + *scribere*, to write). In music, an arrangement of a composition for instruments or voices other than those employed by the composer. See Paraphrase.

TRANSEPT (from Lat. *trans*, across, through + *septum*, *sæptum*, inclosure, partition; connected with *sæpes*, hedge). A projecting wing at right angles with the nave and aisles of a church, forming one of the smaller arms of the cross. The term is improperly used in the singular to designate the two transepts together. In some early basilicas and a few Italian churches of later date (e.g., Santa Croce and San Lorenzo, Florence) the transepts are at the extreme east end, forming a T-plan. The square space at the meeting of the nave and transepts is called the crossing. In the early Middle Ages the transept became quite common and in the Gothic age almost universal. The transepts sometimes project beyond the side aisles; when this is not the case, they show externally by their height above the side-aisle roofs and internally by their width and height, which are equal to those of the nave. The crossing is often surmounted by a spire, tower, or dome requiring much heavier piers than those of the nave and choir generally.

While single transepts were the rule, double transepts were sometimes used in England and Germany. The double English transept was on the scheme of the archbishop's or Passion cross, with both arms east of the nave; the double German transept was connected with the double choir, one at each end of the church. The ends of the transepts in Gothic churches were often treated as façades only second in importance to the main front, with their large rose or wheel windows and their elaborate portals. Those of Notre Dame in Paris, of Chartres, Rouen, and Amiens are particularly beautiful. Many of the English transepts have only one side aisle; the French examples have usually two. See Church.

TRANSFER PROCESS. See Lithography.

TRANSFIG'URA'TION (Lat. *transfiguratio*, from *transfigurare*, to transfigure, from *trans*, across, through + *figurare*, to form, from *figura*, shape, form) of Christ. The temporary revelation of the glory of Jesus during his earthly ministry, recorded in Mark ix. 2–8 and parallel passages. The festival commemorating it can be traced back to the fifth century, but was established on August 6 as a solemn feast for the whole Roman Catholic church in 1457, as a thanksgiving for the victory over the Turks near Belgrade. It was retained as a black-letter festival by the Church of England and restored as a greater feast by the American Episcopal church at the revision of the Prayer Book in 1892.

TRANS'FORMA'TION. See Marble Faun.

TRANSFORM'ER. In electrical engineering, an apparatus for transforming or converting an electric current. The term commonly is applied to a device for transforming an alternating current to a higher or lower voltage. Machines for converting alternating currents to continuous currents and vice versa are known as converters or rectifiers (q.v.) and are described under dynamo-electric machinery (q.v.). Devices for obtaining pulsating currents of high potential from pulsating currents of low potential are described under induction coil (q.v.). Devices for transforming a continuous current at one voltage to a continuous current at another voltage are known as dynamotors and are described under dynamo-electric machinery (q.v.). The present article treats only of devices used to transform alternating currents into other alternating currents differing in magnitude and potential and known as static transformers.

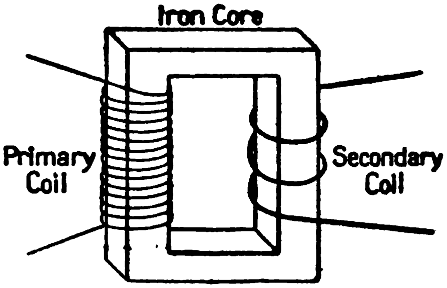

Fig. 1. DIAGRAM OF ESSENTIAL PARTS OF A TRANSFORMER.

A transformer consists of two electric circuits, each made up of turns of insulated conductor, interlinked with a magnetic circuit, usually consisting of iron, in such a manner that any magnetic flux set up by a current in one electric circuit will thread the other. (See Magnetism.) Any change in the current in one of the coils causes a change in the magnetic flux, and a change in the magnetic flux threading the second coil generates a voltage in that coil. If the current in one coil is continually changing, as is the case with an alternating current, an alternating flux is set up and the alternation of that part of this flux threading the second coil produces an alternating voltage in the second coil. At the same time the alternation of the flux produces an alternating voltage in the first coil which opposes the current and is known as the counter electromotive force (C. E. M. F.).

Since with an iron magnetic circuit practically all the magnetic flux set up by the coil into which a current is sent (the primary) threads the other coil (the secondary), there is very little leakage of flux and the voltage induced in any one turn of either coil is practically the same. Thus, if there are 10 turns in the primary coil and one turn in the secondary coil, the counter electromotive force of the primary will be 10 times the induced electromotive force of the secondary coil, whereas, in accordance with the law of conservation of energy, if power is given out by the secondary it must be taken from the primary, and both members have very nearly the same power, i.e., the product of volts and amperes in the primary is equal to the product of volts and amperes in the secondary. Hence the currents are inversely proportional to the voltages or to the respective numbers of turns in the two windings.

The winding having the greater number of turns and the higher voltage is known as the high-tension winding; the one with the lower voltage and turns is the low-tension winding. The winding connected to the source of energy is called the primary and that connected to the load the secondary. If the low-tension winding is the primary we have a step-up transformer, and if the high-tension winding is the primary we have a step-down transformer. The former type is used in power stations to raise the voltage of the alternating-current generators (usually about 2200 volts) to a suitable voltage for the transmission line (30,000 to 60,000 volts), while the step-down transformer is used at the other end of the line to lower the voltage of the transmission line to a voltage suitable to the consumer.

When the secondary winding is closed through an external circuit, a current will flow and set up a magnetic reaction. The turns of the secondary carrying a current form a magnetomotive force opposing the primary flux and tending to reduce it. A reduction in primary flux causes a decrease in the counter electromotive force, which permits more current to flow in the primary, so that the primary winding may always be resolved into two magnetomotive forces—one overcoming the counter magnetomotive force of the secondary and one unopposed producing the primary flux. The latter unopposed magnetomotive force results from the magnetizing current or no-load current.

Since in practice both windings have electrical resistance, there will be a loss of voltage in each whenever current flows, and thus the observable voltage at the terminals of the secondary or load will be less than that generated by the primary flux, and the voltage impressed on the primary must be greater than the counterelectric force by the amount of the resistance drop in that circuit.

Since it is impossible to place the two windings so that all the flux set up by either winding will interlink the other winding, there is a leakage of flux between the two windings, and besides the mutual or useful flux common to both windings each winding has an additional flux caused by its own particular current and linked only with itself. The windings are thus inductive and have induced in them a voltage which serves no useful purpose, but reacts against the main voltage. This is the same in effect as if choke coils (i.e., coils so wound as to have considerable reactance) or inductances were connected into the external part of each winding. The reactive voltage in such an inductance is out of phase with the current which produces it, and its effect must be shown by vector relations. If the current is in phase with the useful voltage, the reactive voltage is at one-quarter period out of phase or at right angles to the useful voltage. On the other hand, if the load is inductive and the current lags behind the useful voltage, the reactive voltage will be directly subtractive. Thus, when supplying a load the secondary external voltage for a given impressed voltage on the primary is less than when the transformer is not loaded, and the ratio of transformation is different, being less than the ideal in a step-up transformer and more than the ideal in a step-down transformer. The transformer is said to have a regulation expressed by the percentage decrease in secondary terminal voltage from no load to full load.

Under all operating conditions there must be a certain mutual magnetic flux in order to produce voltage, the voltage depending upon the magnitude of this flux and its rate of change, i.e., the frequency of the impressed voltage. To produce this flux a magnetizing current must flow. This magnetizing current is in phase with its flux and therefore out of phase with the voltage, as an alternating voltage is always one-quarter period out of phase with the flux which produces it. The magnetizing current is therefore said to be reactive or wattless, as it represents very little active power or heat power. On the other hand, the alternation of the magnetic flux in the iron produces various losses in the iron known as hysteresis (q.v.) and eddy-current losses. (See FOUCAULT CURRENTS.) Hence a small component of the no-load current must be in phase with the voltage to supply this heat-power loss and is known as the energy component of the no-load current.

These losses are reduced as far as possible in practice by using specially selected steel having a low hysteresis loss and a high electrical resistance to reduce the eddy-current loss. Recent forms of steel containing silicon are very good in this respect. In addition the steel is divided into thin sheets or laminations to reduce the value of the loss from eddy currents.

The loss in voltage due to the electrical resistance of the two windings also represents a loss of energy, and the energy output of the secondary is less than the amount of energy input to the primary due to these so-called copper losses as well as the losses in the iron called the core loss. Thus, the energy equation of the transformer is Input = Output + Core loss + Copper loss in both windings. The core loss varies only a fraction of a per cent between no load and full load and is called a constant loss, while the copper loss, being proportional to the square of the current, is very nearly proportional to the square of the load. It is called the variable loss. At that load of any transformer at which the copper loss is equal to the iron loss the efficiency is a maximum.

These losses of energy manifest themselves in the body of the transformer as heat, and a considerable skill is displayed in the design of a transformer to dispose of this heat without causing a rise in temperature of the transformer which will injure the insulating materials used. This is accomplished by allowing spaces in the iron core between the windings and the core and between various parts of the windings themselves. These are known as ducts, and through these ducts either oil or air is circulated to carry off the heat. The former method gives what are known as air-cooled, and the latter, oil-cooled transformers. The air-cooled type is usually supplied with a ventilating fan to force the air through the transformer, while the oil-cooled type is placed in a large tank of oil, and as the oil next to the heated parts of the body becomes heated, it rises to the top, is replaced by cooler oil, and the hot oil gives up its heat to the sides of the tank, which in turn transmit it to the surrounding outside air.

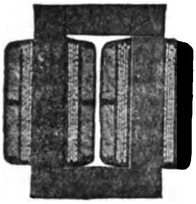

FIG. 2. CORE-TYPE TRANSFORMER.

Transformers are divided into two types in accordance with the arrangement of their magnetic and electric circuits. The core type (Figs. 1, 2) consists of one magnetic circuit with the two electric circuits wound on the two legs of a rectangular core, the windings being divided into many sections and interspersed to reduce the magnetic leakage. The shell type (Fig. 3) consists of two magnetic circuits with a common leg around which the various sections of the two windings are placed. The relative advantages of the two types are a matter of detail of design and mechanical construction, but in 1916 the core type was growing in favor and the shell type was declining.

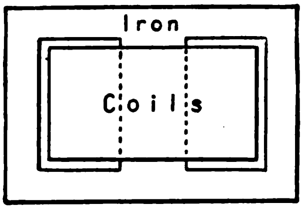

FIG. 3. SHELL-TYPE TRANSFORMER.

The first transformers were constructed by Michael Faraday in England in 1831 and nearly at the same time by Joseph Henry in the United States. Faraday discovered that when the current in a coil was varied a voltage was induced in a near-by coil, although both were stationary and did not touch. This is called mutual induction. For a long time the only application of this discovery was in the making of induction coils (q.v.), Ruhmkorff coils, and other similar small apparatus. With the introduction of alternating currents into electrical engineering, however, the transformer found a wide field of application. When a current flows through a conductor there is a loss of energy proportional to the resistance of the conductor multiplied by the square of the current. The energy transmitted, however, is proportional to the product of the current and the voltage. If we double the voltage we can use one-half the current for the same energy transmitted, and one-half the current gives one-quarter the amount of energy lost as heat in the conductor. From this relation comes the law that the amount of copper required in a conductor to transmit a given amount of energy over a given distance with a certain loss is inversely proportional to the square of the voltage used. It is desirable to use a high voltage in the transmission system, but it is dangerous and inconvenient to use a high voltage in the generating machinery and particularly in the small devices in which the energy is utilized. It is thus economically advantageous to use step-up transformers between the generators and the transmission line and to use step-down transformers between the transmission line and the load.

The transformer is therefore the keystone of the present-day transmission systems, making it possible to operate the transmitting lines at from 60,000 to 150,000 volts and still use safe and convenient voltages in the machinery at each end of the system. By this means it is possible to transmit electrical energy economically over distances of from 100 to 200 miles. Transformers for 100,000 volts are quite common, those for 150,000 volts are found in commercial operation, while transformers for 750,000 and 1,000,000 volts are in use for testing purposes. In regard to size the largest units are of 15,000 kilo volt ampere capacity. Transformers for a given power are much smaller in bulk than any other class of electrical apparatus of the same capacity on account of their high efficiency, and on this account as well as because they have no moving parts they are much cheaper.

There are three general classes of transformers: (*a*) constant potential; (*b*) current or series; (*c*) constant current. The first class is intended to receive power from a circuit of approximately constant potential and deliver an approximately constant potential. The great majority of power transformers are of this class. The current or series transformer is intended to be connected in series with the load, is independent of the potential, and is designed to deliver from its secondary a current bearing a definite proportion to the primary current. It is used for supplying instruments and controlling devices. Its success depends upon the accuracy and constancy of the relation of the currents in the two windings. The constant-current transformer is intended to receive energy from a source of constant potential and to supply a constant current in the secondary irrespective of the amount of the load. It is used for supplying arc lamps operating upon a series circuit. The method of operating is

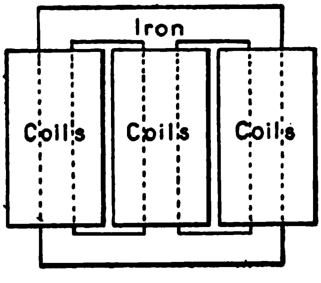

FIG. 4. THREE-PHASE TRANSFORMER.

to vary the relative position of the two windings and thus the amount of flux from the primary which interlinks the secondary.

Power transformers may be single phase, containing one primary circuit and one secondary circuit, or polyphase, containing two or three primary circuits and a like number of secondary circuits, one primary and one secondary each wound on one of several legs of the magnetic circuit having a common connection (Fig. 4).

An autotransformer, sometimes called a compensator, but more properly named a single-circuit transformer, consists of a single electrical circuit wound on a magnetic core. When a voltage is impressed upon this circuit and a current flows, a flux is set up which generates the same counter electromotive force in each turn of the winding. If a connection is made to the middle point of this winding, the voltage between this point and either extremity is one-half of the total, and if the intermediate connection is made at any other point the main voltage is divided into parts directly proportional to the number of turns between the special connection and the main terminals. It is thus possible to get any fractional voltage desired by tapping at the proper turn of the single winding. This device is used when it is desired to obtain a transformation of voltages varying only slightly from unity, i.e., from 100 volts to 80 volts. The current will be inversely transformed. The advantage of the arrangement is that, when the ratio of transformation is not very great, much less copper and somewhat less iron are required for the same output. If the difference between the primary and secondary voltage is 10 per cent of that of the primary, the device need have only 10 per cent of the size of the usual two-circuit transformer.

A potential regulator is a special form of transformer in which the secondary coil is connected in series with the primary so that its voltage is either added to or subtracted from the primary, giving a convenient regulation of voltage. The magnitude of the secondary voltage is varied by changing the position of the magnetic circuit so that the amount and direction of the flux set up by the primary may be varied with respect to the secondary. It is used for regulating the voltage at the ends of alternating-current transmission circuits.

An induction regulator is a device constructed like a polyphase induction motor, but both members are normally stationary and each phase of the secondary is designed for a low voltage and connected in series with one primary phase. The flux set up by the primary rotates according to the law of the polyphase magnetic field and induces voltages in the secondaries proportional to the number of turns. By varying the position of the secondary with respect to the primary by hand, the secondary voltage may be added to or subtracted from the primary or may be connected in some intermediate phase so that it is possible to vary the voltage per phase by gradual increments from primary minus secondary voltage to primary plus secondary voltage. Its use is the same as the potential regulator, except that it is adapted to polyphase circuits.

Bibliography. S. P. Thompson, *Dynamo Electric Machinery*, vol. ii (7th ed., New York, 1905); Gisbert Kapp, *Transformers for Single and Multiphase Currents* (2d ed., ib., 1908); C. P. Steinmetz, *Theory and Calculation of Alternating Current Phenomena* (4th ed., ib., 1908); H. M. Hobart, *Design of Static Transformers* (ib., 1911); Franklin and Esty, *Elements of Electrical Engineering*, vol. ii (3d ed., ib., 1912); Vladimir Harapetoff, *Experimental Electrical Engineering and Manual for Electrical Testing* (2d ed., 2 vols., ib., 1912–13); W. T. Taylor, *Transformer Practice* (2d ed., ib., 1913); D. C. Jackson, *Alternating Currents and Alternating Current Machinery* (new ed., ib., 1913); Harold Pender (ed.), *American Handbook for Electrical Engineers* (ib., 1914); W. P. Maycock, *Alternating Current Work* (ib., 1915); also *Transactions of the American Institute of Electrical Engineers* (ib., annually) and the *General Electric Review* (Schenectady, monthly).

TRANSFU'SION OF BLOOD (Lat. *transfusio*, from *transfundere*, to pour from one to the other, from *trans*, across, through + *fundere*, to pour). The injection into one person of blood taken from another, either directly, from vein to vein, or after it has been defibrinated. The operation has been regarded as legitimate in obstetric surgery since the year 1824, when Dr. Blundell published his well-known work entitled *Physiological and Pathological Researches*. The operation had, however, been vaguely known to the medical profession for the last four centuries; and there are obscure allusions in the Roman poets, which would seem to indicate that it was practiced as early as the Augustan age. References to transfusion are also found in the papyri of the Egyptians and in the works of Pliny and Celsus. Pope Innocent VIII was transfused in 1492, three boys who acted as donors losing their lives, probably from air embolism, in this unsuccessful experiment. The older and rather formidable operation of transfusion gave way for a long time to the operation of infusion into the veins or subcutaneous tissues of a hot saline solution of a temperature of 100° F. to 120° F. This solution contains sodium chloride in the proportion in which it is found in solution in normal physiological tissues (about 0.6 per cent). But during the past few years the technique of blood transfusion has been much simplified, and the procedure is undertaken with success in simple hemorrhage, as in the case of bleeding from gastric or intestinal ulcer, after surgical operations entailing shock and loss of blood; and in altered blood conditions such as those occurring in pernicious anæmia, acute gas poisoning, cancer, etc. Transfusion may be direct or indirect. In the latter method the desired amount of blood is withdrawn from the donor into a glass jar containing a small amount of sodium citrate solution to prevent clotting. The resulting mixture is injected into a vein of the recipient. The direct method is the most satisfactory, and its use was largely stimulated in America by the work of Crile in 1898 and Carrel in 1902. Their method involves dissecting out the veins. A still simpler procedure was invented by Linderman, which with modifications is now the favored method. Two small needles connected with cannulas are inserted—one into a vein of the donor, the other into a vein of the recipient. A series of Record syringes are now filled rapidly with blood from the donor and emptied into the vein of the recipient, warm saline solution being injected in the intervals to keep the blood from clotting in the needles. The process may be further simplified by interposing a three-way stopcock, which renders the flow nearly continuous. Consult J. S. Horsley, *Surgery of the Blood Vessels* (St. Louis, 1915).

TRANSISTHMIAN CANAL. The projects for a transisthmian canal have included two principal routes, the Nicaragua and the Panama, though there also has been a discussion of a number of secondary routes, some of which have been investigated by engineers and received study for many years. The most thorough and comprehensive study of recent years was that made by the Isthmian Canal Commission in 1899–1901, and not only were the two main routes discussed, but also other possible projects. The political questions involved have largely been confined to the Nicaragua and Panama schemes, and as these propositions have attracted such widespread attention in the past and as each possesses certain unique features, both engineering and otherwise, they will be found fully treated under their respective heads. (See NICARAGUA CANAL; PANAMA CANAL.) It might be said, however, that the United States Senate, on Feb. 18, 1916, ratified a treaty with Nicaragua whereby, in exchange for a payment of $3,000,000, the exclusive rights for an interoceanic canal across Nicaraguan territory were granted and a naval base in the Gulf of Fonseca ceded for 99 years.

The result of many examinations showed that there was no probability of the existence of any practicable canal location between Panama and the mouth of the Atrato River except by the adoption of a tunnel line, and there seemed to be no reason for further field work except in the interest of geography. Consult *Report of Isthmian Canal Commission*, 1899–1901 (Washington, 1901), and the bibliography under NICARAGUA CANAL and PANAMA CANAL.

TRANSIT INSTRUMENT (Lat. *transitus*, passage over). An astronomical instrument consisting principally of a telescope fixed to a horizontal east-and-west axis and revolving in the plane of the meridian. It is employed, as its name denotes, in the observation of the meridian transits of the heavenly bodies, i.e., in noting the exact instants when they reach the meridian of the observatory. The axis, which is the most important part of the instrument and thus demands the utmost care in its construction, consists of a hollow sphere or cube, to opposite sides of which are tightly fastened the bases of two cones in whose apices the pivots are screwed; the sphere or cube is pierced for the admission of the telescope, which is firmly fastened at right angles to the axis. One of the pivots is hollowed so that a stream of light can be directed from a lantern halfway along the interior of the axis, and through an aperture in the side, into the telescope tube, where, being received by a small reflector, set at 45° to the axis and telescope tube, it is directed to the eyepiece, rendering visible a series of fine spider threads stretched across the field of view. The pivots must be carefully turned to a perfectly cylindrical form and fitted into the instrument so that they are accurately in line. One extremity of the axis carries one and sometimes two small graduated circles, each supplied with index, clamping screws, and vernier; these circles are capable of indicating angular measures to within 1′ or 2′. There are three adjustments necessary before a transit instrument can be used: the axis must be horizontal; the sight line of the telescope, as marked by the spider threads, must be at right angles to the axis of motion; and the latter must be placed so as to point accurately east and west. On the perfection of the first two of these adjustments depends whether the telescope sweeps over a great circle of the sphere, and the third is necessary to insure that this great circle shall be the meridian of the place of observation. These adjustments can never be made quite perfect, and the usual mode is to investigate the amount of error in each and allow for it by a calculated correction applied to the observed time of the star's crossing the meridian. To note accurately this observed time by the astronomical clock is, as we have said, the essential part of a transit observation. It is best done by means of a chronograph (q.v.), an instrument with which an automatic record of the observed time can be made by means of an electric signal sent out directly from the observer's hand. The transit used by engineers will be found described and illustrated under SURVEYING INSTRUMENTS.

TRANSIT OF VENUS. The passing of Venus across the sun's disk, seen when the planet is exactly in line with the sun and the earth at inferior conjunction. The two planets, Mercury and Venus, whose orbits lie between the sun and the earth's orbit, can at times pass between us and the sun. They can then be seen in the telescope, appearing as black dots projected on the luminous solar surface. These transits can occur only when the earth is near one of the nodes of the planet's orbit, i.e., in the case of Venus in June and December and in the case of Mercury in May and November, and at the same time the angular distance between the centres of the sun and the planet is less than the sun's angular semidiameter, or about 16′. On account of the inclination of the planet's orbit to the ecliptic, this means, in the case of Venus, that the planet must be less than about 1° 42′ from the node, and the smallness of this limit alone shows that transits of Venus are of rare occurrence. At present the intervals in years between successive transits occur in the following order: 8; 121½; 8; 105½; 8; 121½. The last two transits occurred on Dec. 8, 1874, and Dec. 6, 1882; the next two will not take place until June 8, 2004, and June 6, 2012. Two transits of Mercury have already occurred during the present century, viz., on Nov. 12, 1907, and Nov. 6, 1914. The remaining dates for the century are given below; it will be noticed transits of Mercury are more frequent than those of Venus.

May 7, 1924
November 8, 1927
May 10, 1937
November 12, 1940
November 13, 1953
November 6, 1960
May 9, 1970
November 9, 1973
November 12, 1986
November 14, 1997

If the exact instant of time be observed when the planet first touches the solar disk and again when it finally leaves it, the observations can be used to calculate the solar parallax and the distance from the earth to the sun. Transits of Venus are especially well suited for this purpose, and they have been very elaborately observed in the past, especially in the years 1874 and 1882. Unfortunately experience has proved that it is impossible to observe the required instants of time with sufficient precision, and other methods of measuring the sun's distance are now preferred by astronomers.

Transits of Mercury are not well adapted for solar parallax observations and are indeed of quite minor importance astronomically. See Black Drop; Parallax.

TRANSKEI (träns-kī′) **TERRITORY.** A dependency of the Cape Province, South Africa, between the Great Kei River and Tembuland. Area, 2552 square miles. Pop., 1911, 188,895 (2189 whites), this being the most densely populated part of Cape Province. The territory is administered by a chief magistrate and is subject to the Native Territories Penal Code.

TRANSLATION. See Mechanics.

TRANSLATION, Sense of. See Static Sense.

TRANS′LEITHA′NIA. A name applied to the eastern division of the Austro-Hungarian monarchy on account of its position east of the Leitha River, which forms a part of the boundary line between the two divisions of the monarchy. See Cisleithania.

TRANSMIGRATION. See Metempsychosis.

TRANSMISSION GEAR, in Motor Vehicle. See Motor Vehicle.

TRANSMISSION OF POWER BY ELECTRICITY. The electrical transmission of energy in considerable quantities from the point of generation to one or more distant points of delivery. This excludes telegraphy and telephony where energy is transmitted over a wire but in small quantities. Energy is transmitted in order to utilize a cheap, convenient, or otherwise advantageous source of energy supply, and the total cost of generation and transmission to the point of use must be less than would be the cost of generation at the point of use, otherwise such transmission would not be profitable. Therefore transmission plants are usually supplied by water power or by cheap coal, and the electricity is derived from generators. In general the term "transmission" would include any arrangement for the transmission of electrical energy from a generator to the utilizing devices, but by convention among engineers the term is confined to the transmission of energy at comparatively high voltages over considerable distances without any division or distribution of the energy, while the term "distribution" applies to the transmission of energy from a local centre to various utilizing devices over distances of 1 or 2 miles and at voltages from 100 to 2000. Each transmission line is therefore only a part of the whole system and is augmented by distribution lines in order to make the system complete. The weight of copper required to transmit any amount of energy for any distance with any specified loss in power is directly proportional to the square of the distance and inversely proportional to the square of the voltage, and is given in exact terms for direct-current work and to a close approximation for alternating-current work by the formula $W = 125\ PD^2 + KE^2$, where W is the weight of copper in pounds, P is the power delivered in watts, D is the distance one way in thousands of feet, K is the ratio of power lost in the line to the power delivered, and E is the voltage delivered.

The fundamental fact in the transmission of energy by electricity is that great distances can be economically overcome only by the use of high voltages. This explains why direct current is seldom considered as a means of transmission. Direct-current generators cannot be built for more than 1500 volts on account of the trouble at the commutator. To connect a large number of such generators in series involves great difficulties in the use of the energy at the receiving end. The motors must also be connected in series and be insulated to stand the maximum voltage. This limits their use to places where skilled supervision can be exercised. There are a few instances of the use of direct-current transmission in Europe, but in the United States there is none.

Voltages. The alternating-current system lends itself admirably to high-voltage transmission because the alternating-current transformer (q.v.) permits the use of any convenient voltage in the generators, such as 2200, and this may be easily and economically transformed to a high voltage suitable for transmission, such as 30,000 to 150,000. At the load end of the line other transformers receive the high voltage and transform it to some low alternating voltage suitable to the consuming devices. Thus, the alternating-current transformer makes possible the economical operation of high-voltage transmission lines. The usual voltages employed in transmission lines vary from 30,000 to 150,000 volts, depending upon the amount of power and the distance over which energy is to be transmitted, and practice shows that the voltage chosen is about 1000 for each mile of transmission. With the higher voltages the expense for copper for a given power decreases very rapidly, but the expense of the insulators and poles increases, and the cost for insulation at voltages over 100,000 is very considerable. At this voltage the phenomenon of the loss of energy between the two wires suspended in air, known as corona and due to the breaking down and ionization of the air, becomes of importance, and to reduce this loss it is necessary to space the wires at a considerable distance from each other and to increase the size of the wire used.

The electrical energy may be transmitted in the form of single-phase, two-phase, or three-phase alternating currents as well as by direct current. Single-phase and direct-current systems require two wires, the three-phase requires three wires, while the two-phase system requires four wires. For a given voltage between wires the relative weights of copper required are: single-phase and two-phase, 100; three-phase, 75; direct-current, 50. For reasons mentioned above the direct-current system is not much used and the three-phase system, being next in economy of copper, is most generally used. The single-phase system is objectionable because single-phase motors are not easily made to be self-starting and have a poorer efficiency than the three-phase, while the three-phase induction motor is a very satisfactory device.

Frequencies. The frequency of the alternating current is either 25, 50, or 60 cycles per second. From the point of view of the transmission line alone 25 cycles is preferable on account of the lesser effect of the inductance and capacity of the line and the advantages of a low frequency for generators and motors of very large size. But for lighting purposes the higher frequency is necessary and the cost of transformers is less with the higher frequency. The inductance of a line depends upon the length of line and the distance between the wires and produces a reactive drop in voltage proportional to the frequency. This loss in voltage does not represent a loss of energy, but interferes with the voltage regulation. The capacity of a line depends upon the length of the line and the proximity of the conductors to each other and is very great in underground cables. The capacity causes a charging current proportional to the voltage and frequency, which may be called an idle current, as it represents no energy but flows even at no load.

As a result of the inductance and capacity of a transmission line which represent energy stored either in electromagnetic or electrostatic form, the line is subject to dangerous potentials whenever anything causes a sudden variation in the distribution of this stored energy.

Line Construction. The construction of a transmission line may consist either of wooden poles and wooden cross arms carrying the wires on glass or porcelain insulators, or steel latticework poles, or sometimes towers carrying the wires suspended from the arms by suspension insulators. The wooden pole is satisfactory and cheaper for voltages up to about 60,000, while the steel type is better for the higher voltages. In the wooden-pole construction the insulators are fastened rigidly on upright pins on the cross arms, and the conductors, consisting usually of copper but sometimes of stranded aluminium, are laid on these insulators and fastened to them. The poles are usually from 40 to 50 feet in height, spaced 100 to 150 feet apart, and carry two cross arms with duplicate transmission lines on each side of the pole, giving increased capacity and reliability. The steel construction may consist either of lattice poles for moderate voltages or large towers for high voltages with duplicate lines. The latter are 40 to 60 feet high, spaced from 400 to 600 feet apart and arranged to place the wires from 5 to 10 feet apart, the wires being hung from arms on the tower by suspension insulators connected like links in a chain.

The wires used are generally between No. 2 and No. 0000 Brown and Sharp gauge, and solid if of copper, but of larger cross section and stranded around a steel core if of aluminium. A transmission line usually costs from $2000 to $4000 per mile, not including the cost of the right of way.

Cables. Another type of transmission developed as a result of conditions in the large cities is by means of underground cables, in which the three conductors, shaped roughly like sectors of a circle, are insulated from each other and from the outside by rubber or preferably paper and the whole incased in a lead sheathing and sometimes by a steel armor. This type of transmission is in general use at voltages of 13,000, and there are certain examples in operation with voltages as high as 30,000. It is much more expensive to install and used only where local conditions require it.

Regulation. The line regulation is the difference between the voltage delivered and the voltage impressed at the generator end of the line and in practice has values from 5 to 20 per cent, as the loss in voltage due to the self-inductance of the line may be quite great and varies considerably with the load. This variation in voltage is no longer objectionable, as regulating devices are available which will maintain the voltage delivered to the customer fairly constant irrespective of the voltage of the transmission line. The loss of energy and power in the transmission line varies from 5 to 15 per cent and depends largely upon economic conditions. If the cost of energy at the source is low, it is advisable to be economical in the amount of copper installed in the line and thus save in the cost of the line. This relation is expressed in a very general form by what is known as Kelvin's law, which states: "The most economical transmission system is that in which the annual interest on the cost of the copper of the line is equal to the value of the energy lost in the line in one year." However, this does not take account of the cost of the poles, insulators, right of way, maintenance, etc., and must be qualified in practice.

Notable Installations. As interesting examples of the latest practice in electrical transmission of energy in 1916, the following installations may be mentioned: the Pacific Light & Power Co., at Los Angeles, Cal., transmits 60,000 kilowatts over 241 miles at a voltage of 150,000 and a frequency of 60 cycles; the line consists of aluminium conductors. The Ausable Electric Co., near Battle Creek, Mich., transmits 19,000 kilowatts, a distance of 245 miles by means of copper conductors operating at 140,000 volts and 60 cycles; this in 1916 was about the longest line in commercial operation. The Hydro Electric Power Commission of Ontario transmits 107,000 kilowatts from Niagara Falls to Toronto and other cities, a distance of 135 miles, using both copper and aluminium conductors and operating at 110,000 volts and 25 cycles. The Mississippi River Power Co. has a plant of 112,000 kilowatts' capacity, with provision for 225,000 kilowatts ultimately, at Keokuk, Iowa, using the power of the Mississippi River; this is transmitted over a distance of 144 miles by means of copper conductors at 110,000 volts and 25 cycles and is the largest capacity in a single plant.

Distribution Systems. The local distribution of electric energy may be by direct currents, by single-phase alternating currents, or by polyphase alternating currents. The choice between the alternating-current system and the direct-current system depends upon the character of the apparatus used for the load and upon the available current. Direct-current motors are usually preferable to alternating-current motors on account of their convenience and ease of control, but are limited in the voltage at which they may be operated. The alternating-current system allows a greater freedom in the choice of voltage on account of the simplicity and cheapness of transformers. The single-phase system is preferable for lighting alone on account of the simplicity of its connections, but if many motors are to be supplied either the two-phase or three-phase system should be used on account of the superior starting ability and efficiency of the motors. The three-phase system is generally used at present on account of the economy of copper in distribution. If the power is to be used for a combined load of lighting as well as motors, a frequency of 50 or 60 cycles is preferable, as the flickering of the lamps at 25 cycles is unpleasant, although such lamps are in use in some cities.

The most convenient voltage for local distribution is the 220-volt 3-wire system, in which 220-volt motors are operated between two of the wires and 110-volt lamps and small motors may be operated between the third wire and either of the others. This is a very common arrangement both for direct-current and single-phase distribution. If many large motors are to be used, 500 to 600 volts is chosen on account of the lesser copper required, and this is the usual voltage in the distribution of energy for street and interurban railways. In the three-phase system a voltage of 220 between lines is the more common, although voltages of 110, 440, and 550 are in use. It is also quite customary to distribute at 2200 volts and use step-down transformers for a group of motors.

The use of the electric motor in factories and shops is becoming more general, and on account of the convenience and the economy of energy the electric motor is rapidly taking the place of shafting and belting for the transmission of energy, even for the short distances between the power station and the machinery of a factory. Large and medium size machines are driven by individual motors, and groups of small-size machines are driven by one motor and a short shafting. Recent types of electric motors are designed to have a range of speed of 1:3 or 1:4 by very gradual steps, resulting from a control of the field. This gives a very nice control of the machine. Another advantage of the use of electric motors is that, when one machine or group of machines is not in use, the motors driving them may be shut down and a waste of energy may be avoided.

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TRANS-MISSISSIPPI EXPOSITION. An exposition held in Omaha, Neb., June–October, 1898. The site covered about 200 acres, a mile north of the city. The main buildings, with exhibits devoted to agriculture, fine arts, machinery and electricity, manufactures, mines and mining, and the United States government, were grouped around a grand court and surrounded the lagoon or canal which terminated at its west end in a lake 400 feet across, at the end of which was an electric fountain. The grounds were skillfully improved by gardening, until the prairie gained the name of Magic City. Of special interest among the features was the ethnological gathering of 500 Indians, representing 25 tribes. The total attendance was 2,613,508, and the total receipts $1,924,077.

TRANS′PADANE REPUBLIC. A republic formed by Napoleon in 1796 on the south side of the Po and in 1797 united with the Cispadane Republic, on the north side, to form the Cisalpine Republic (q.v.).

TRANS′PIRA′TION (from Lat. *trans*, across, through + *spirare*, to breathe). The evaporation of water from the aërial surfaces of plants. The term is used instead of evaporation, first because the evaporation is modified by the action of the living organisms, and, second, because the absorption of radiant energy by the organism prevents the complete stoppage of evaporation when the plant is surrounded with a saturated atmosphere. In most land plants transpiration from the epidermal cells is inconsiderable, because such become nearly waterproof by cutinization of the outer walls. The cells bordering the interior air chambers (see AËRATION) are nearly or completely saturated with water, and from them it evaporates readily into the air occupying these spaces, whence it finds its way by diffusion through the stomata (q.v.). The rate of transpiration will be determined by the relative humidity of the outer air, temperature, wind, light, etc. Transpiration is unavoidable, because gases must be absorbed from the air (see ABSORPTION); it is necessary, at least to some plants, for cooling; and it is advantageous for the movement of dissolved salts. See CONDUCTION.

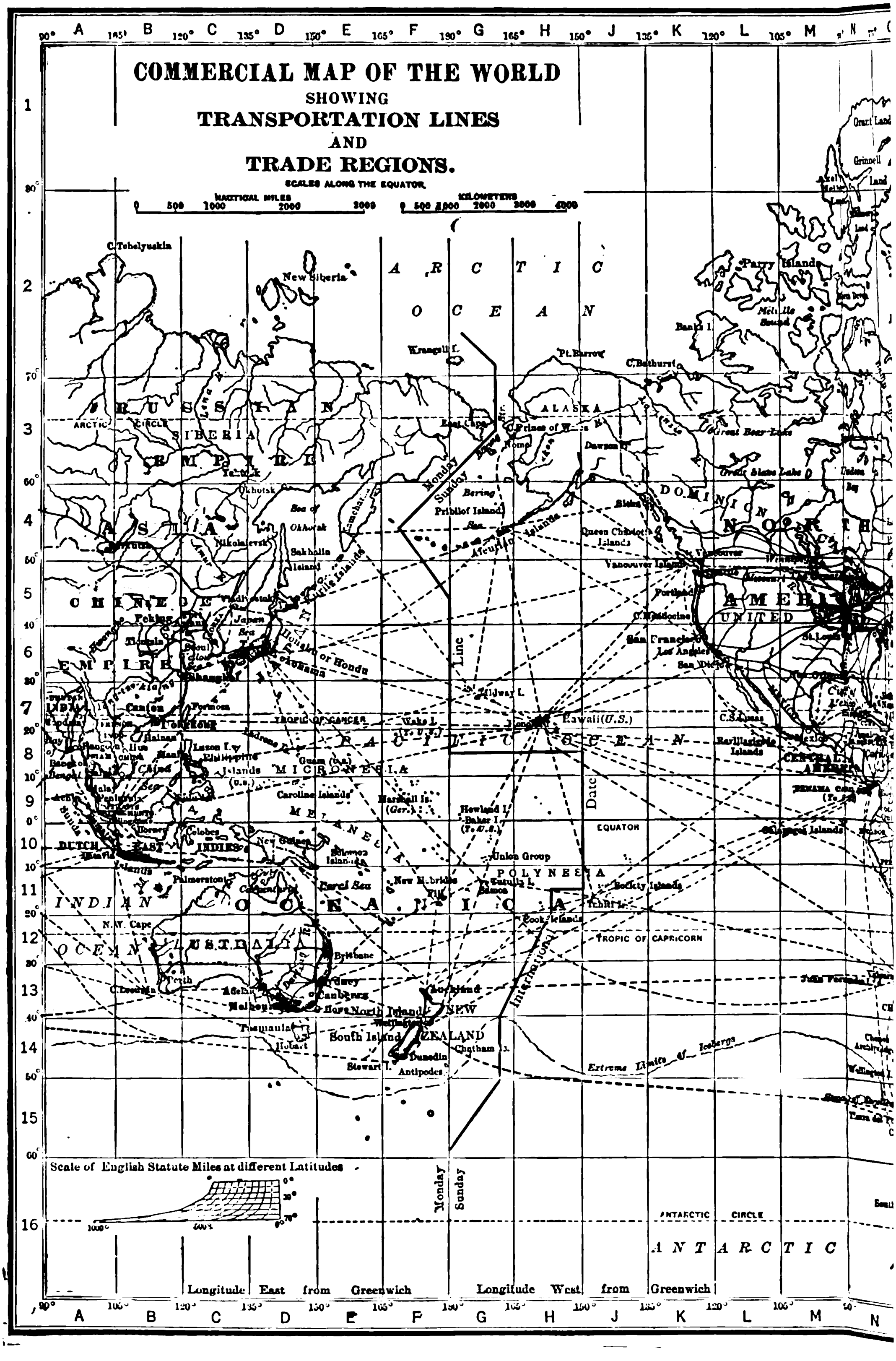
Since excessive loss of water is one of the greatest dangers to which plants are subject, plants growing in dry regions show a great variety of adaptations to reduce the rate of transpiration and to conserve the moisture which reaches them. (See XEROPHYTES.) The amount of water transpired varies greatly on account of variation in external conditions and internal structure. A few examples of transpiration under normal conditions will illustrate. In 12 hours on a hot, dry day a sunflower 3.5 feet high, having a leaf area of 5316 square inches, lost 30 ounces of water. The loss of water from 100 square centimeters of leaf surface in 24 hours for the pea was 2.51 grams, for the hop 4.3 grams, for the hemp 9.3 grams. Estimates as to the loss of water during the growing season by the plants of wheat grown on one hectare (about 2.5 acres) equal 1,179,920 liters, and by oats 2,277,760 liters. If all this water could be caught and condensed on the same area, it would reach in the first case a depth of 118 millimeters (4⅝ inches) and in the second 228 millimeters (9 inches). A beech tree having 200,000 leaves was estimated to lose between 300 and 400 liters (about 2 barrels) on a hot day. See ENERGY OF PLANTS.

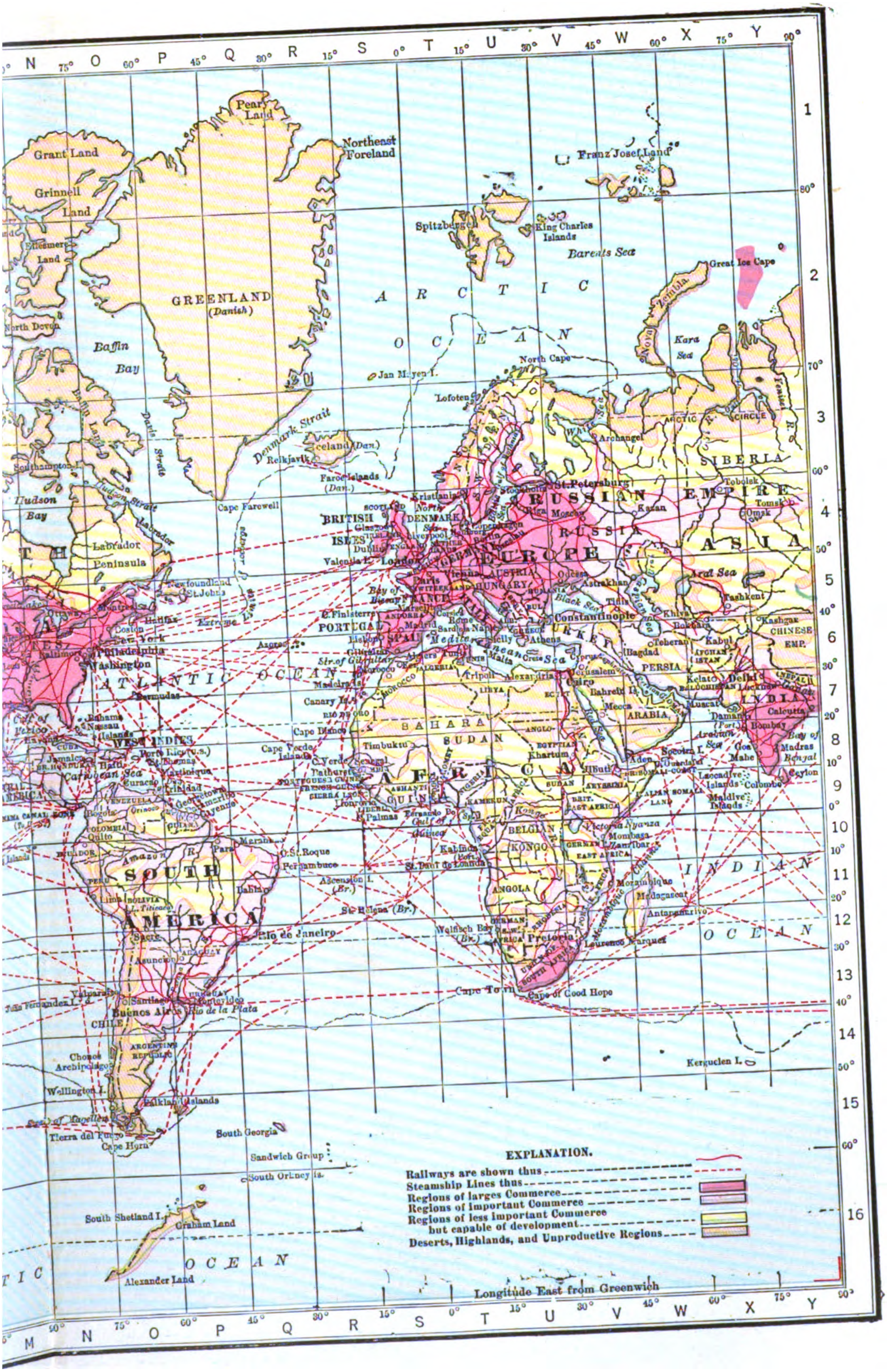
TRANSPIRATION OF GASES. See DIFFUSION; EFFUSION.

TRANS′PORTA′TION. The carrying of persons and goods from place to place. The part which transportation plays in the practical life of a community depends most directly upon the complexity of its economic system. Wherever the division of labor and the localization of industry have reached a high degree of development transportation necessarily attains a correspondingly high development. The rise of industry on a great scale and the creation of efficient means of transportation mutually condition each other.

More than 1000 years before our era Phœnician ships were trading in the Mediterranean, and later along the shores of the same sea the Greek cities built up their colonial and trade system. Rome was relatively late in developing maritime traffic, but by the time of the Empire an extensive commercial system had arisen, bringing to Rome the raw produce of Sicily and north Africa and extending westward even beyond Gibraltar. Ancient land transport was comparatively insignificant. The Greek roads were chiefly to sacred places, such as Delphi, and their economic importance was small. The Ro-

COMMERCIAL MAP OF THE WORLD
SHOWING
TRANSPORTATION LINES
AND
TRADE REGIONS.





EXPLANATION.

Railways are shown thus ——
Steamship Lines thus - - - -
Regions of larges Commerce ——
Regions of important Commerce ——
Regions of less important Commerce but capable of development ——
Deserts, Highlands, and Unproductive Regions ——

man roads were established for military rather than economic reasons, but they were vastly more extensive. Centring at Rome, they not only stretched through Italy, but (under the Empire) to Constantinople and Asia Minor, along parts of the north coast of Africa, westward to Spain, over the Alps to Gaul, and through Britain. Excellent as these roads often were, their method of construction was wastefully expensive from the modern standpoint.

The return to a more primitive economy in the early Middle Ages meant that for a time transportation should cease to play any important part in the economic life of Europe. The salient points in the story of its gradual revival are the stimulus given by the Crusades to trade with the East, the consequent growth of the Italian cities, and, in the twelfth century, the formation of the great trade league (Hansa) of the north European towns. Although the rise of towns and the establishment of fairs made a certain amount of land or river transport necessary, it was slow, insecure, and costly and, at least on the Continent, was subject to burdensome and arbitrary tolls. The destruction of the Eastern caravan routes through the Turkish and Mongol invasions gave especial importance to the discovery of an ocean route to the Indies made by Portuguese navigators at the end of the fifteenth century. The introduction of the compass made transoceanic voyages readily possible. The discovery of America made them profitable, and helped to shift the centre of trade from the Mediterranean to the Atlantic, from the Italian cities to the Portuguese, the Spanish, and the Dutch. The growth of colonial empires, based essentially on transportation, marks a most important era in the world's economic history.

Land transport lagged far behind that on the sea. With the growth of centralized nations a political motive arose for the improvement of roads and of internal trade. Under Louis XIV (1643–1715), during the ministry of Colbert, the French roads were greatly bettered, and many of the local tolls were put aside. In England little effective action was taken by the central government, and, despite many Turnpike Acts (granting rights to levy tolls in return for maintaining roads) the English highways remained poor throughout the eighteenth century, till the efficient road-making methods of McAdam (1756–1836) and Telford made possible the great improvements of the nineteenth. In the United States, as in England, private or local activity has been chiefly relied on for road making. Private turnpikes were constructed in Colonial times, and during the "internal improvement" era, after 1800, Federal roads were built. Roadbuilding has been recently carried on systematically in many parts of the United States.

The slowness and costliness of land transportation, even in the eighteenth century, made it impossible to convey ordinary goods any long distance. An era of canal building, which began in England soon after 1750, met in part the increasing need of the growing industrial centres for communication with one another and with the sea. The same movement appears in the United States in the first quarter of the next century. With the rise of the factory system following 1760, with the application of steam power to mining and manufactures, and the possibilities of machine production on a large scale, came an imperative need for more rapid and more adequate means of transport, which only the railroad and the steamship could supply. Through them, in the nineteenth century, international industry has been made possible.

The following table, from the *Report of the United States Commissioner of Navigation* (1915), shows the merchant marines of the world, according to *Lloyds Register* (1915–16). Only vessels of over 100 tons are included.

COUNTRY	SAIL		STEAM		TOTAL	
	Number	Net tons	Number	Net tons	Number	Tonnage (steam, gross) sail, net
British:						
United Kingdom	610	305,663	8,675	11,760,277	9,285	19,541,368
Colonies	525	137,487	1,543	930,764	2,068	1,732,700
Total	1,135	443,150	10,218	12,691,041	11,353	21,274,068
United States:						
Sea	1,347	943,288	1,233	1,655,718	2,580	3,522,933
Northern Lakes	31	92,323	569	1,681,788	600	2,323,397
Philippine Islands	8	2,280	61	26,549	69	46,309
Total	1,386	1,037,891	1,863	3,364,055	3,249	5,892,639
Germany	269	286,860	1,897	2,661,945	2,166	4,706,027
Norway	516	551,379	1,658	1,179,568	2,174	2,529,188
France	523	376,119	1,016	1,090,809	1,539	2,285,728
Japan	.....	....	1,155	1,162,331	1,155	1,826,068
Italy	522	222,914	655	925,464	1,177	1,736,545
Holland	99	24,028	710	922,860	809	1,522,547
Sweden	372	101,087	1,090	594,808	1,462	1,122,883
Russia	512	202,811	744	498,105	1,256	1,054,762
Austria-Hungary	11	1,515	422	630,840	433	1,018,210
Greece	77	15,734	433	561,330	510	908,725
Spain	54	13,449	588	539,134	642	899,204
Denmark	249	51,295	586	474,278	835	854,996
World's total, including above with all other countries	6,212	3,532,561	24,508	28,159,895	30,720	49,261,769

It appears from these figures that steamships comprise 68 per cent of the world's vessels (not reckoning China, Turkey, etc.) and nearly 89 per cent of their tonnage, although for some nations the percentages are much higher. The preponderance of British ships is most notable in steamships. In 1801 there was in the United Kingdom a total net tonnage of 1,786,000; in 1850 the figure was 3,565,000; in 1880, 6,575,000; in 1915, 12,065,940. The percentage of net steam tonnage was 4.7 in 1850, 41.4 in 1880, and 97.4 in 1905. German shipping grew still more rapidly. The sailing tonnage decreased from 1,223,000 in 1885 to 286,860 in 1915, but the (net) steam tonnage rose from 520,186 in 1885 to 1,057,525 in 1895 and from 1,910,660 in 1905 to 2,661,945 in 1915.

Before the introduction of iron ships American builders were greatly favored by the cheapness of native timber, and for this and other reasons American shipping was dominant in the world's carrying trade. The tonnage engaged in foreign traffic was 667,000 in 1800, and, though somewhat set back by the War of 1812, it rose to 1,439,000 in 1850 and 2,497,000 in 1861. This was its maximum. The coasting trade continued to rise from 1,117,000 in 1840 to 2,645,000 in 1860 and from 4,286,000 in 1900 to 6,486,000 in 1915, including vessels of all sizes. But foreign shipping had fallen to 1,314,000 in 1880 and in 1910 was but 782,000. However, on account of the Great War, this increased to 1,863,000 in 1915. While in 1860 66.5 per cent of the imports and exports of the United States were carried in American vessels, in 1870 the percentage was only 35.6; in 1880, 17.4; in 1890, 12.9; and in 1900, 9.3. Yet in 1915 the percentage rose to 14.3.

The growth of railway mileage since 1830 is shown in the following table, compiled from the *Journal de la Société de Statistique de Paris*, 1909–10:

GROWTH OF RAILWAY MILEAGE SINCE 1830

YEAR	United States	Great Britain and Ireland	France	Germany	Russia	The World
1830	23	57	24	......	......	121
1840	2,818	838	303	360	17	4,792
1850	9,021	6,624	1,870	3,761	311	23,980
1860	30,626	10,437	5,865	7,285	989	67,055
1870	52,922	15,151	11,019	12,253	6,982	128,407
1880	93,262	17,929	16,109	21,057	14,617	230,515
1890	166,654	20,334	24,030	26,638	19,225	377,746
1900	194,334	21,932	26,611	31,933	29,892	491,236
1910	240,438	23,285	30,185	37,337	36,880	625,659

For further statistics and general discussion of this subject, see RAILWAYS; STEAM NAVIGATION.

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TRANSPORTATION, CONDUCT OF. See RAILWAYS.

TRANSPORTATION, IN LAW. See ADMIRALTY LAW; CARRIER, COMMON; COMMERCE; HIGHWAY; MARITIME LAW; PUBLIC CALLING; ETC.

TRANSPORTATION, PENAL. Banishment from society in the form of exile, ostracism, or outlawry. The practice is well known among uncivilized peoples and existed among the ancient nations and in mediæval Europe. In England, under a Statute of Elizabeth (1597), "dangerous rogues" might be banished by justices in quarter sessions, but no system of transportation can be said to have arisen till the time of Charles II, when justices were empowered to send certain offenders to America instead of inflicting the death penalty. In 1717 transportation was authorized as a substitute for other punishments than hanging, and the contract system, by which individuals agreed to transport convicts in return for their labor during the period of sentence, was established. The business was profitable at first, but became less so, until a payment had to be made for each criminal transported. Protests from America were frequent but unavailing. After 1776 a twofold system was developed. To meet immediate needs, hulks stationed in the Thames (later at Portsmouth and other places) were arranged to receive convicts; and though this was begun merely as a temporary expedient, it endured as a legalized system for over three-quarters of a century. Involving overcrowding and bad sanitary and moral conditions, the hulk system was severely criticized by several parliamentary committees, but was abolished only gradually, as penitentiaries were constructed.

Within a decade after 1776 a settlement for criminals had been founded in Australia (q.v.). In 1787 the first lot of convicts left for New South Wales. In 1804 transportation to Tasmania began. The number sent was at first small. The annual average up to 1816 was less than 600, but it reached 2000 in 1820–30. The spirit and practice of the system were essentially penal, not reformatory, and conditions of life in a colony where most persons were convicts were almost inevitably bad. The report of the parliamentary committee of 1838 condemned the system at almost all points, and (1842) a "probation system" was planned by which prisoners were classified and might pass through various stages towards pardon or freedom. The difficulty of the scheme was to find work in the colonies for ticket-of-leave men or "probationers," while the matter was further complicated by an increasing objection of the colonists to the importation of convicts. Norfolk Island was for years a criminal depot, first of criminals from New South Wales, and, afterward for about 20 years, after 1826, from Van Diemen's Land. Transportation to New South Wales ceased after 1849 and to Tasmania after 1852. Thenceforth Western Australia was from 1850 the only outlet, and though the probation system worked there successfully, the colony was unable to provide for all English convicts. With the development of the system of penal servitude (1853–63) transportation declined, and the last shipment to Western Australia was in 1868.

In France penal transportation was established by a Law of 1854. Guiana was at first utilized as a place to send criminals, but its climate proved quite unsuitable, and after 1864 most prisoners condemned to transportation were sent to New Caledonia. Here the penal settlement numbered over 1200 in 1894, when transportation to that colony was discontinued. According to the present law persons condemned to hard labor, if military offenders or recidivists, may be sent to Guiana. In a representative year the number of convicts sent to Guiana runs between 700 and 800. Russia is the only other modern nation which has practiced transportation on a large scale. Siberia (q.v.) was made a place of settlement in the seventeenth century, and after the discovery of the mines the system grew apace. Between 1807 and 1899 it was estimated that 865,000 persons had been transported to Siberia. Since 1869 the island of Sakhalin (q.v.) has been used largely as a penal colony. In 1896 it contained 15,000 convicts and exiles and less than 3000 free settlers. The horrors of Siberian exile have been mitigated in recent years. Convict labor does not prove of permanent economic advantage, and in Siberia, as elsewhere, it has been found impossible to colonize a country with convicts. In 1900, following the investigation of a commission of 1899, the Russian penal system was radically reformed. Imprisonment is to take the place of exile for all except political and religious offenders. No further attempt is to be made to settle convicts as colonists, but all those exiled will remain imprisoned during their sentences. Consult: Franz Holtzendorff, *Die Deportation als Strafmittel in alter und neuer Zeit* (Leipzig, 1859); Sir E. F. Du Cane, *Punishment and Prevention of Crime* (London, 1885); Kropotkin, *In Russian and French Prisons* (ib., 1887); George Kennan, *Siberia and the Exile System* (2 vols., New York, 1891); F. H. Wines, *Punishment and Reformation* (new ed., ib., 1910); H. De Windt, *The New Siberia: Visit to Penal Islands of Sakhalin* (London, 1896).

TRANSPORTATION AND WATER WORKS. See Public Utilities, Regulation of.

TRANSPOSING INSTRUMENTS (from *transpose*, OF., Fr. *transposer*, from Lat. *transponere*, to transpose, from *trans*, across, through + *ponere*, to place). Those musical instruments whose natural scale is always expressed in C major irrespective of the actual pitch. Some composers have begun to disregard the keys in which parts for such instruments were always written and to employ the key of the piece for *all* instruments. See Musical Instruments.

TRANS′POSI′TION (Lat. *transpositio*, from *transponere*, to transpose). In music, the performance of a composition in a key other than the one in which it was written by the composer. Vocal works are most frequently transposed, as when a tenor wishes to sing a work originally written for low voice. Transposition occurs also often in transcription. Singers have no difficulty in transposing a song into any key, but the transposition at sight upon any instrument, especially the organ or pianoforte, is difficult. See Score.

TRAN′SUBSTAN′TIA′TION (ML. *transubstantiatio*, change of substance). A word used by Roman Catholic theologians to designate the change which they believe to take place in the eucharistic elements of bread and wine in virtue of the consecration. The term was first officially adopted by the Church at the Lateran Council of 1215, and the doctrine involved by it explicitly defined as an article of faith by the Council of Trent: "The whole substance of the bread is changed into the body of Christ, and the whole substance of the wine into his Blood, the species alone remaining."

The definition of the manner of Christ's presence is theological, and the terms thereof rest on Scholastic philosophy, which to-day is the system, taught in all Catholic seminaries. It is based upon the belief in the existence in everything of an essential distinctive principle not cognizable by the senses, called substance; the species or accidents of the thing are qualities which are perceived by the senses—color, taste, smell, solidity, etc. In transubstantiation, accordingly, the accidents remain unchanged, while the underlying substances of bread and wine cease to exist, their places being taken by the substance of the body and blood of Christ. The objections to the doctrine have been chiefly drawn from the philosophical difficulties which are involved in it; and the defenders of it have therefore added to the proofs which they profess to draw from the Scripture and tradition a general demonstration that the doctrine, although mysterious, does not involve any philosophical repugnance or impossibility. Leibnitz (q.v.), although a Protestant, has not only entered at great length and in several portions of his works into this philosophical discussion, but professes to prove, by strict philosophical principles—by the consideration of the properties of matter, of substance, of space, extension, and the like—that the essential principle of the body "may exist in many places at the same time, nay, under far-distant and distinct species." See Lord's Supper, and bibliography there given; also Substance.

TRANSVAAL, träns-väl′, or Province of the Transvaal; formerly South African Republic. A British possession in South Africa (Map: Cape of Good Hope, H–K 5). There were transferred to Natal, in January, 1903, 7000 square miles of area, including the districts of Vrijheid, Utrecht, and a section of the Wakkerstroom District, with a total population of nearly 60,000, 8000 being whites. Its area is 110,426 square miles.

The interior of the Transvaal is a bush country (Bosch veld) lying 4000 feet above sea level, studded with small hills. In the east this plateau is terminated by the northern Drakensberg, culminating in the Mauchberg (8730 feet). On the eastern border are the Lebombo Mountains. Across the interior plateau stretches from east to west the far-famed Witwatersrand, with Johannesburg and the rich gold fields, which separates the Limpopo and the Vaal basins. Just north of the Witwatersrand and in general parallel with it extend the Magalies Mountains. Pretoria lies at the eastern outlet of the narrow valley thus formed. In the centre of the extensive Drakensberg system, which occupies the whole eastern third of the colony, is Barberton with its gold fields. The Transvaal is drained mainly by the Limpopo River, which forms the boundary on the northwest and north, and the Vaal River, which forms most of the southern boundary. The Olifant River, the principal affluent of the Limpopo, has nearly its entire course within the Transvaal. The Barberton region is drained by the Komati, which flows into the Indian Ocean. None of the rivers of the Transvaal, however, are navigable.

The climate west of the Drakensberg and south of the Magalies Range is subtropical, with a European character. The mean annual temperature is 67° F. January is the warmest month, July the coldest. There are winter frosts. The northern and eastern sections of the Transvaal are more tropical, especially the valley of the Limpopo. Rain, on the whole very uncertain, is most prevalent from October to April, and it ranges from 40 inches in the east to 12 in the west. The climate of the interior uplands is noted for its healthfulness. Among the distinctive trees are the thorny acacias and the eucalyptus. The range of plants is very large, including the European grains and many of the valuable tropical species. The northeastern section is the least fruitful. The flocks and herds of the Boers were very large before the War of 1899–1902, and horses were also bred, though to a much less extent.

Granite and slate are in general the basic formations, upon which rests the so-called Cape Formation, above which are found quartzite and coal-bearing layers. The Transvaal is exceptionally rich in minerals, including copper, iron, coal (in different sections), lead, diamonds (in the Pretoria District and in the southwest corner in the direction of Kimberley), and notably gold. Gold was first discovered in 1867 and is now found abundantly in numerous districts. The rich gold fields of the Witwatersrand—the Rand, of which Johannesburg is the mining centre—and those of Barberton have made the Transvaal particularly famous. Around them developed the history of the colony. From 1905 to the end of 1914 the value of the gold produced was £312,546,987, chiefly in the Rand. The largest output was in 1912, 9,107,512 ounces, £38,686,250; in 1914, 8,394,322 ounces, £35,656,814. Other important mineral products in 1914 were: diamonds, 1,142,683 carats, £1,162,031; coal, 5,157,268 tons, £1,150,746; tin ores, 3386 tons, £307,282; copper, 14,957 tons of concentrates, £320,327; silver (contained in gold bullion and base metal ores), 890,782 ounces, £102,471. The total mineral production in 1905 was valued at £22,698,275; in 1913, £42,500,410. The number of persons working at the gold mines in January, 1915, was 21,966 whites and 178,229 colored. The diamond mines are situated chiefly in the Pretoria District; in January, 1915, 367 whites and 222 colored were engaged in diamond mining. The coal mines are in the Barberton, Middelburg, and Pietersburg districts; in January, 1915, 566 whites and 10,332 colored were engaged in coal mining. Copper mining has increased rapidly in recent years.

The country is well adapted to agriculture and stock raising, though its possibilities are as yet meagrely developed. The area under cultivation is increasing and amounts to upward of 2,000,000 acres, but much agricultural produce has to be imported. Maize and tobacco are regarded as the most important crops. At the end of 1913 sheep numbered 5,024,898; goats, 2,104,527. Horses in 1913 numbered about 89,000; mules, 25,000; asses, 106,000; cattle, 1,339,000; swine, 303,000; ostriches, 5400. Manufacturing is not greatly developed, but there are iron and brass factories, breweries, brick, tile, and pottery works, grain and saw mills, machine shops, and factories for tobacco, soap, ice, explosives, etc. Since the establishment of the Union of South Africa foreign-trade statistics are not published for the separate provinces.

The principal imports are ironwork and machinery, chemicals, wood, sugar, preserved meats, flour, articles of apparel, and live animals. The exports are principally mining products, wool, tobacco, horses, and mules. The largest amount comes through the Cape Province, though almost as much enters through Natal. The Transvaal has railway communication with the sister provinces and with Portuguese East Africa. At the end of 1913 there were 2638 miles of railway open to traffic, of which all but 6 miles was government line.

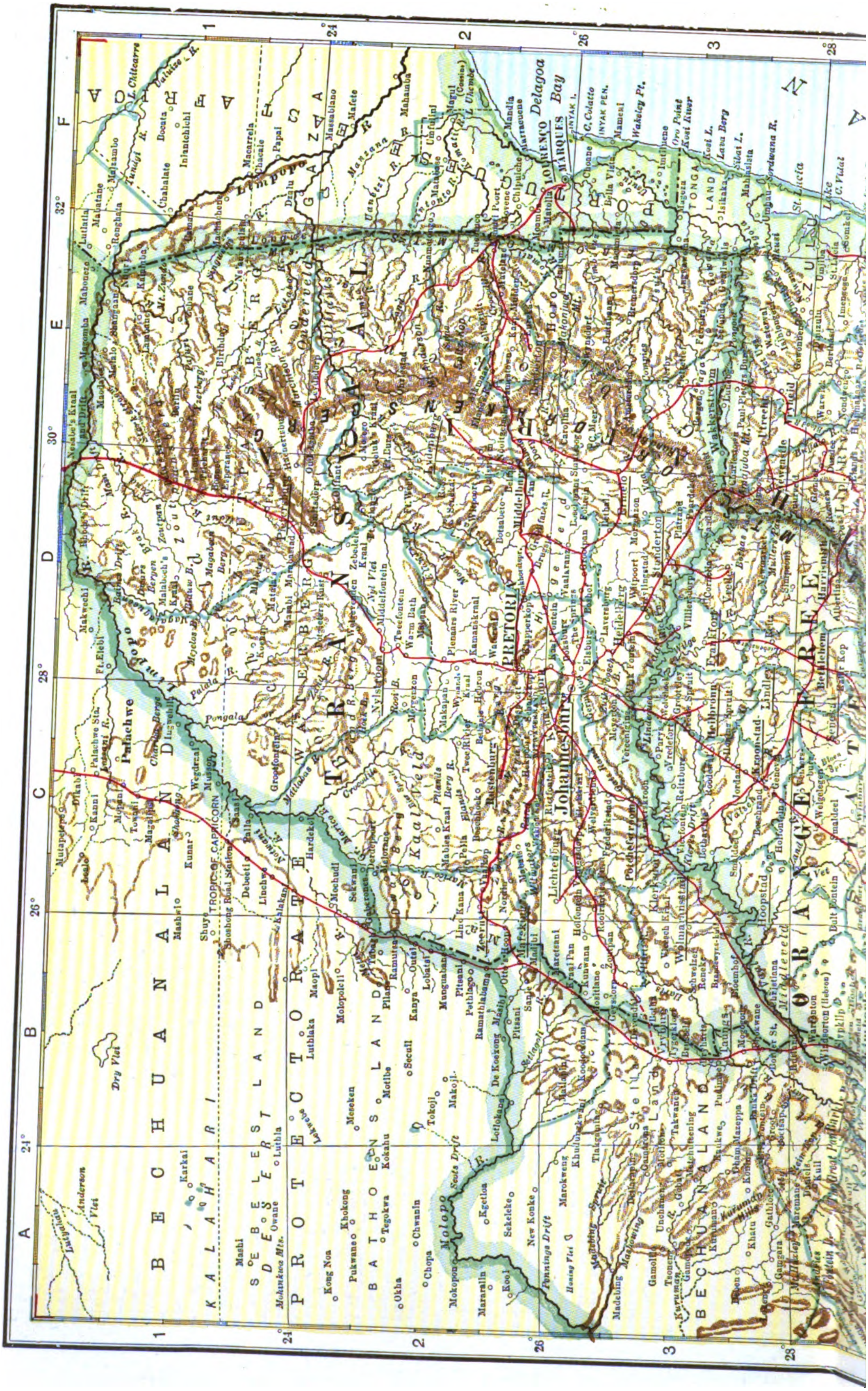
The Transvaal was annexed to Great Britain, Sept. 1, 1900. After an intermediate period of military rule and crown colony government it received in 1906 a constitution, which provided for a bicameral legislature consisting of an elective lower house of 69 members and a nominated upper house of 15 members. The Transvaal is one of the original provinces of the Union of South Africa, established May 31, 1910. It has an administrator appointed by the Governor-General for five years and a provincial council of 36 members elected for three years. The province elects eight members to the Upper House and 45 members to the Lower House of the Union Parliament. The suffrage is conferred on every white male British subject. The capital is Pretoria (q.v.), which is also the seat of the Union administration. For the fiscal year 1915 the estimated revenue was £1,308,900; expenditure chargeable against revenue, £1,349,580; capital expenditure, £435,801.

The population was returned by the censuses of 1904 and 1911 as follows:

RACES	1904	1911		
		Males	Females	Total
Whites..........	297,277	236,913	183,649	420,562
Bantu..........	937,127	705,862	513,983	1,219,845
Mixed and other colored......	35,547	28,780	17,025	45,805
Total......	1,269,951	971,555	714,657	1,686,212

The most numerous Bantu race is the Basuto, with 455,801 in 1911; next are the Tonga, 171,848, and the Bechuana, 106,500. East Indians numbered 10,048, and persons returned as "mixed," 22,655. The white and other adherents of the leading churches were as follows in 1911: Dutch churches, 204,058 and 24,634; Anglican, 89,805 and 51,355; Methodist, 27,938 and 92,969; Presbyterian, 24,739 and 6670; Lutheran, 6618 and 101,271; Roman Catholic, 22,312 and 6439. Persons returned as of no religion numbered 943,616.

History. The Transvaal was one of the two states founded by the Boers after the "great trek," or emigration, from Cape Colony. These Boers were descendants of the colonists who had come into South Africa under the Dutch control. They were a hardy, vigorous, bigoted race, holding the natives in slavery and hence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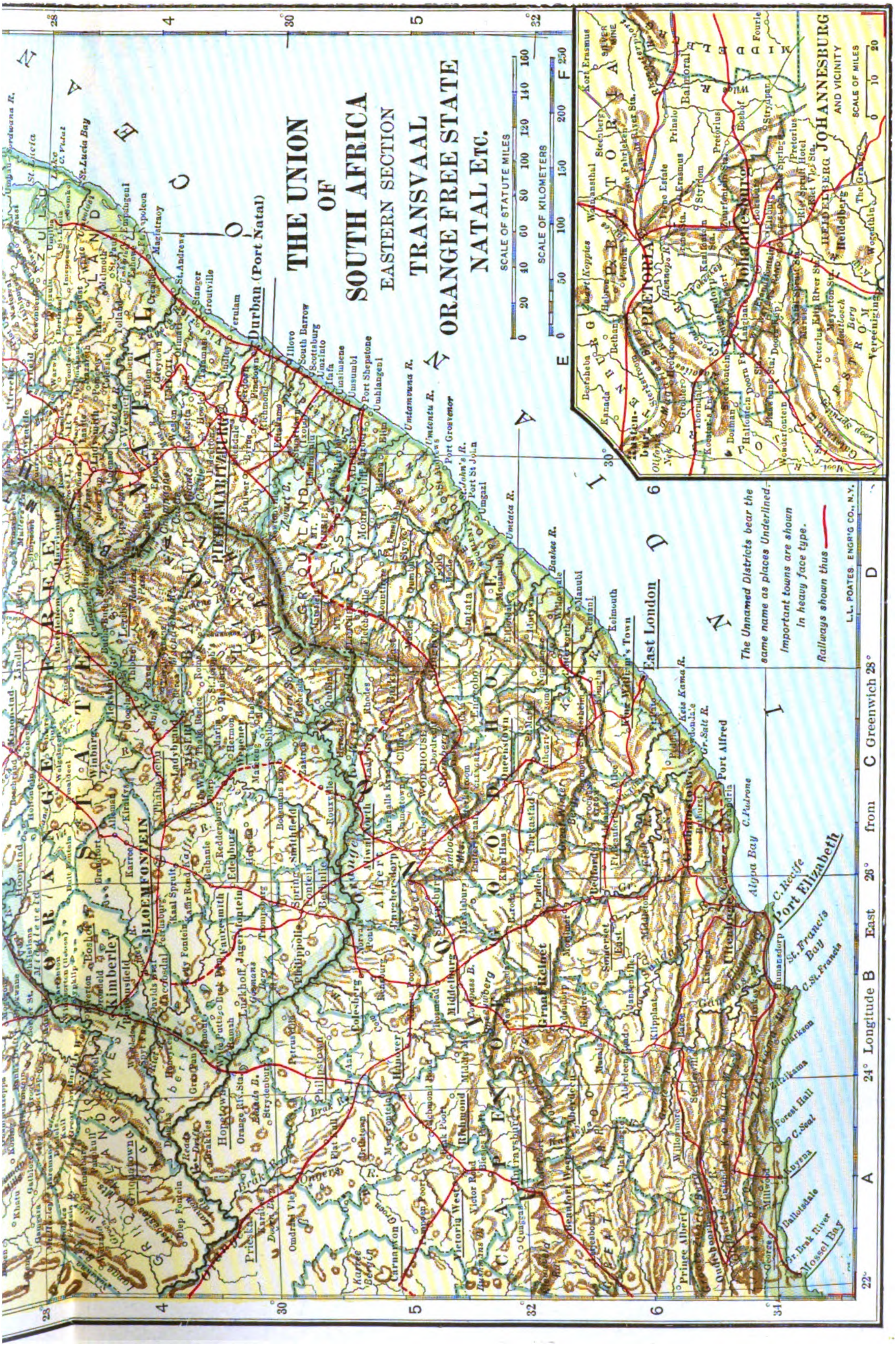
DESERT
BECHUANALAND
BATHOENS LAND
TROPIC OF CAPRICORN
Limpopo R.
Molopo R.
TRANSVAAL
WATERBERG
ZOUTPANSBERG
Kalk Veld
Hooge Veld
PRETORIA
Johannesburg
Potchefstroom
Lichtenburg
Heidelberg
Middelburg
Lydenburg
Barberton
Standerton
Wakkerstroom
Vryheid
Utrecht
ORANGE
FREE STATE
Kroonstad
Heilbron
Bethlehem
Harrismith
Hoopstad
Warrenton
Griqualand
Kuruman
Mafeking
Zeerust
Palachwe
Shoshong
Delagoa Bay
LOURENCO MARQUES
TONGA LAND
ZULU
St. Lucia
GAZA
Inhambane



THE UNION OF SOUTH AFRICA

EASTERN SECTION

TRANSVAAL

ORANGE FREE STATE

NATAL ETC.

The Unnamed Districts bear the same name as places Underlined.

Important towns are shown in heavy face type.

Railways shown thus

L. L. POATES ENGR'G CO., N.Y.

not getting along well with their savage neighbors. The dislike of the English which naturally arose after the latter took possession of Cape Colony in 1806 culminated in 1833, when the Emancipation Law was passed. Some years later a considerable number of the Boers went north with their families, flocks, and household goods and at first founded a colony at Natal. This was broken up by the British government in 1843, and the Boers, going westward, founded the Orange Free State. In 1848 this also was taken under British control (remaining thus, however, only for a few years), and the more irreconcilable of the Boers "trekked" once more, across the Vaal, and founded the South African Republic, commonly known as the Transvaal. By the Sand River Convention, concluded in 1852, Great Britain recognized the independence of "the emigrant Boers living north of the Vaal River" and boundaries were duly established. The new state was for some years allowed to take its own course, and the only interference with its increasing prosperity came from the struggles with the natives, between whom and the Boers there was bitter enmity. In 1877 some discontented burghers suggested to the British government that the Transvaal should be taken under its protection. Mistaking the appeal of a faction for national sentiment, the British Commissioner, Sir Theophilus Shepstone, declared the Republic British crown territory, and annexation was persisted in by the British government in spite of repeated appeals. In 1880 the people revolted against the British régime. On December 13 a mass meeting was held at Heidelberg and the restoration of the independent Republic was declared. A brief campaign, in which the Boers developed remarkable fighting powers, according to methods especially adapted to the country, followed this act. The Boer victories of Laing's Nek and Ingogo were followed by the battle of Majuba Hill (Feb. 27, 1881), which resulted in the worst defeat sustained by British arms in many years. On Aug. 8, 1881, peace was concluded by the Convention of Pretoria, in which self-government was restored to the Transvaal burghers, subject to the suzerainty of the British crown. This latter reservation gave Great Britain the right to maintain a British Resident in the country and to march her armies across the territory in time of war and also the control of external relations. The Convention of London, signed Feb. 27, 1884, omitted the suzerainty clause, and the Boers claimed that thereby Great Britain gave up all control over their affairs. The British government, on the contrary, maintained that the Convention of London was supplementary to that of Pretoria, and that the latter was in force except where directly contravened by the former. In the years 1881–93 several events occurred which reacted upon the relations of Great Britain and the South African Republic. The first of these was the formation in Cape Colony of the Afrikander Bond, with a platform calling for a union of European races in South Africa on a basis of South African nationality and independence. This movement increased the dislike of the British government to the development of any strong, independent power in the neighborhood of the British South African possessions. The advance of the English into Mashonaland and Matabeleland, which the Boers had coveted and which hemmed them in, was to them an added irritation; and the climax was reached in the aggressive attitude of the British South Africa Company, which held rights of exploitation and administration in the new British territories.

The discovery of gold in the Transvaal in 1884 opened a new and troubled era. Hitherto the country had been agricultural and rural, with a homogeneous population. Now there was a sudden influx of mining men, promoters, and adventurers of all nations. In the Witwatersrand was founded the populous mining city of Johannesburg, inhabited very largely by these Uitlanders, or outlanders. The Boers felt that the primitive life they had wished to preserve was invaded, circumscribed, and likely to be overwhelmed. They therefore sought to restrict the privileges of citizenship in order to retain the political control in their own hands. This led to constant friction and to attempts to secure British intervention. In the autumn of 1895 a plan was arranged between the leaders of the British South Africa Company—Cecil Rhodes (q.v.), his colleague, Mr. Beit, and Dr. Jameson, administrator of Rhodesia—on the one hand, and several leaders of the Uitlanders—Lionel Phillips, Charles Leonard, and John Hays Hammond representing them—on the other, for an armed raid into the Transvaal from Rhodesia for the purpose of bringing about by a display of force the reforms desired. Dr. Jameson made it understood finally that he should act in behalf of the British supremacy. The Johannesburg committee did not apparently intend to overthrow the government, and when this was known sought to stay action while they issued a manifesto calling for the desired reforms. Jameson, disregarding their warning, entered the Transvaal December 29 with 600 men. He was defeated, surrounded, and obliged to surrender (Jan. 2, 1896). The Transvaal government turned the prisoners over to the British government for trial. They were convicted in England and received light sentences. Four of the Johannesburg leaders were condemned to death by the Transvaal courts, but this was commuted to a heavy fine. The raid caused a great excitement and assumed international importance. It brought the agitation and the bitter feeling between the two countries to an acute stage. The controversy, concealing under diplomatic phraseology much irritation on both sides, continued for some time longer. Mr. Chamberlain, the English Colonial Secretary, seemed determined to force the position of the Republic, and President Kruger was obstinate in his refusal to yield any important point. In the autumn of 1899, when war seemed imminent, the Orange Free State decided to make common cause with the South African Republic. On October 9 an ultimatum which made peace and continued negotiation impossible was presented to the British agent at Pretoria and Mr. Chamberlain summarily closed the correspondence. War broke out in November, 1899 (see SOUTH AFRICAN WAR), and ended in May, 1902. As a result the Boer republics were incorporated in the British Empire. The protracted struggle left the Transvaal burghers in a ruined condition, and the first necessity was to restore the rural population to their homes. For this purpose the British government, in the treaty of peace signed at Vereeniging, promised to provide the sum of £3,000,000, and the process of repatriation was immediately begun.

Many Boers, however, preferred exile to living under the British crown, and there was a considerable emigration in the following years to German Southwest Africa, Argentina, Mexico, and the United States. The most prominent question of the years immediately following the war was connected with the supposed difficulty of obtaining an adequate supply of native labor for the Rand mines. An ordinance providing for the importation of Chinese laborers was nevertheless issued by the Legislative Council in February, 1904, and the first consignment of coolies arrived in June. By the end of 1905 about 50,000 Chinese had been brought to the Rand. The hardships of the compound system to which the laborers were subjected resulted in constant, successful attempts at escape, and wandering bands of Chinese soon became a serious menace to life and property in the Rand section. The prospect of the grant of representative government led, in 1905, to the rise of political parties, including the Progressive Association which stood for the maintenance of complete British ascendency, the Responsible Government Association, and Het Volk representing the Boer element. The tremendous victory gained in Great Britain by the Liberals in the general election of January, 1906, was due in very large degree to the general abhorrence for the system of Chinese "servitude" established in the Transvaal. On July 31, 1906, the Liberal government announced a new constitution for the colony (see above, section on *Government*). The first election took place in February, 1907. The conciliatory spirit in which the new government entered upon its duties was shown in a speech of General Botha, who became the first Premier, outlining his programme at a banquet given in its honor at Pretoria in March. He declared that the British government and people had, by the grant of a free constitution, trusted the people of the Transvaal in a manner unequaled in history and that it was impossible for the Boers ever to forget such generosity. His cabinet would do its best to create a united nation, in which one section would not regard the other with contempt or distrust. As soon as responsible government was established in the Orange River Colony, the cabinet would begin to work towards a union of all South Africa. He denied that the government was hostile to the mining interests, but declared its opposition to any combination of corporations aiming at monopolizing portions of the country. No extreme measures would be taken against the employment of Chinese labor, and the natives would also be treated fairly. As regards education, Dutch-speaking and English-speaking children would be taught, up to a certain point, each in his own language.

A great question which agitated the Transvaal was the immigration of Hindus, who came in large numbers to work in the mines. In order to maintain "white supremacy," severe immigration and domicile laws were enacted and many Hindus were compelled to leave the country. On May 31, 1910, the Transvaal was united with Cape of Good Hope, Natal, and the Orange Free State to form the new Union of South Africa, and Pretoria was made the capital and the seat of government of the new federal union. For the further history of the Transvaal, see Union of South Africa.

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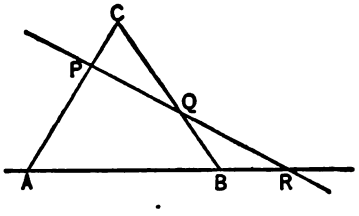
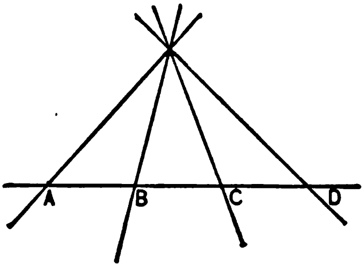
TRANSVER'SAL (ML. *transversalis*, from Lat. *transversus*, *traversus*, *transverse*, p.p. of *transvertere*, to cross, transverse, from *trans*, across, through + *vertere*, to turn). In geometry, a term commonly applied to a line cutting a pencil of parallels. In modern plane geometry the term is extended to mean any straight line cutting the other lines of a figure. Thus, any line intersecting the three lines forming a triangle ABC in P, Q, R, is a transversal of the triangle. The theory of transversals is one of the most important in modern geometry. It has its origin in a theorem attributed to Ptolemy (q.v.), but which is found in the *Spherics* of Menelaus (q.v.) and which has been thought to go back to Hipparchus (q.v.). This states that a straight line drawn arbitrarily in the plane of a triangle determines on the lines of its sides six segments such that the product of three not having a common extremity equals the product of the other three. More generally, of course, a transversal may be



a curve cutting other curves, and in particular a geodetic line cutting the sides of a spherical triangle. Pappus (q.v.) in his *Collections* approaches the theory from another standpoint and shows that if a pencil of four lines is cut by a transversal in the points A, B, C, D, the ratio $\frac{AC}{AD} = \frac{BC}{BD}$ is constant for any position of the transversal. Pappus also showed that if a transversal cuts the sides and diagonals of a complete quadrilateral, the six segments determined on this transversal are such that the product of three not having a common extremity will equal the product of the other three; that each diagonal is cut harmonically by the other two; and that when a hexagon has three of its vertices collinear and the other three also collinear, the intersections of the opposite sides are collinear also—a special case of Pascal's theorem on a hexagon inscribed in a conic. Desargues (q.v.) in his *Essai pour les coniques* generalized the theorem of Pappus with respect to the quadrilateral. He showed that, if a transversal cuts a conic and a quadrilateral inscribed therein, the product of the segments between either point of the conic and two opposite sides of the quadrilateral will have to the product of the segments between this point and the other two opposite sides the same ratio as between the corresponding products when the other point of the conic is taken. The theory was extended by Pascal, who was a friend of Desargues, and later by Newton, Cotes, and Maclaurin. In more recent times Carnot and Poncelet have been among the foremost to elaborate the theory. To Carnot is due the introduction of negative lines in the theory of transversals, and the treatment of the subject as related to modern geometry. See CONCURRENCE AND COLLINEARITY, Ceva's and Menelaus' theorems being important examples of the theory of transversals.



TRAN'SYLVA'NIA (Hung. *erdély*, from *erdő*, forest, the name corresponding to Lat. *Transilvania*, beyond the forest; Ger. *Siebenbürgen*). A former grand duchy and crownland of Austria, since 1867 an integral part of the lands of the Hungarian crown. Area, 57,804 square kilometers. It occupies the southeastern corner of the Hungarian Kingdom, with an area of 21,518 square miles (Map: Hungary, J 3). It is separated from Rumania on the east and south by the great range of the Carpathian Mountains, which bends round at a right angle, the part extending east and west being known as the Transylvanian Alps. The interior is crossed by numerous spurs of the border chains and has an elevated surface cut by many mature valleys of great fertility. The chief river, the Maros, an affluent of the Theiss, crosses the country from northeast to southwest. The southern part is traversed by the Aluta, an affluent of the Danube, which breaks through the Transylvanian Alps in the Red Tower Pass, while the northern part is drained by the Szamos, an affluent of the Theiss. Transylvania has a number of small mountain lakes and is rich in mineral springs. The region is famous for its scenery, and the mixture of nationalities, with the various costumes, adds greatly to its picturesqueness. The climate has a continental character of considerable range in temperature, and in the mountain regions the winters are long and severe. In spite of its mountainous surface Transylvania has a very productive soil. The chief crops are wheat, barley, rye, oats, flax, tobacco, and some industrial plants. Fruits and especially grapes are cultivated extensively. Stock breeding is favored by the abundance of meadow land and is carried on on a large scale. The local breed of horses is superior and many are exported. Wool is an important product. The mineral products include salt, gold, silver, and coal. Wild game still abounds in the mountains and large forests, including bears, wolves, foxes, and boars. Transylvania is well provided with transportation facilities. Pop., 1900, 2,456,998; 1910, 2,678,367. The vernacular of 55 per cent of the population in 1910 was Rumanian, 34.3 per cent Magyar, 8.7 per cent German. The Germans represent mainly descendants of colonists brought into the country from the region of the lower Rhine by King Gejza II of Hungary about the middle of the twelfth century. They dwell mainly in the southern part of the country, the district inhabited by them being known as Saxon Land. Their chief town is Hermannstadt (Nagyrzeben). The great bulk of the inhabitants of Transylvania belong to the peasant class. The nobility and gentry are Magyars. Of the population 29.6 per cent are Greek Orthodox, 28 per cent Greek Catholic, 26 per cent Protestant (including 2.5 per cent Unitarian), 14 per cent Roman Catholic, and 2.4 per cent Jewish.

History. Transylvania formed part of the Roman Province of Dacia. When the great migration of nations took place it was for a time occupied by the Germanic peoples. They were followed by the Avars, after whom came the Petchenegs. In the eleventh century the country was brought under the sway of the Magyars. The advent of German colonists in the twelfth century improved the condition of the country. It was probably not long after this that the immigration of Wallachs set in from the region now called Rumania. Under the Hungarian kings Transylvania was ruled by voivodes. In 1526, after the battle of Mohács, in which Louis II of Hungary was overwhelmed by Solyman the Magnificent, the national party among the Hungarians chose John Zápolya, Voivode of Transylvania, King. He had a rival in Ferdinand I of Hapsburg. Part of Hungary remained in possession of John Zápolya, who was upheld by the Turks. Transylvania was severed from the Kingdom of Hungary, the royal crown remaining in the possession of the Hapsburgs. From 1571 to 1576 the country had an able prince in Stephen Báthory, who in 1575 was elected King of Poland. Other princes of the Báthory (q.v.) family followed. At the beginning of the seventeenth century Transylvania was for a short time in the power of Austria, but in 1604 a great rising of the Protestants in the country and in Hungary took place under the head of Stephen Bocskay (q.v.), who was elected Prince of Transylvania in 1605 and in 1606 forced the Hapsburgs to recognize the liberties of the Hungarian Protestants. In the Thirty Years' War two princes of Transylvania, Bethlen Gábor (q.v.) and George Rákóczy (q.v.), figured among the champions of the Protestant cause. When Leopold I of Austria, after the overthrow of the Turks at Vienna (1683), had made himself master of the heart of Hungary, he proceeded to secure possession of Transylvania. Prince Michael I Apafi (q.v.) had to acknowledge the Austrian ruler as overlord of Transylvania, which was united with Hungary, and his son, Michael II, was forced to renounce his title for a money consideration. In the Peace of Karlovitz, in 1699, the Turkish Sultan recognized the sovereignty of Austria over the country. The Diploma of Leopold I in 1691 had guaranteed to Transylvania its ancient privileges and customs. It was erected into a grand principality in 1765. In the Hungarian revolution of 1848–49 Transylvania was the scene of terrible massacres of the Magyars by the Wallachs and of the victories and final defeat of General Bem (q.v.). In 1849 Transylvania was separated from Hungary and made an Austrian crownland. In 1867 it was again united with Hungary. Transylvania was invaded by the Russians in the Great War. See War in Europe. Consult: G. A. Bielz, *Handbuch der Landeskunde Siebenbürgens* (Hermannstadt, 1857); Karl Reissenberger, *Das Grossfürstentum Siebenbürgen* (Vienna, 1881); Rudolf Bergner, *Siebenbürgen* (Leipzig, 1884); Hauer and Stache, *Geologie Siebenbürgens* (Vienna, 1885); E. Gerard, *The Land beyond the Forest* (London, 1888); *Cambridge Modern History*, vols. ii, iii, v, x–xii (New York, 1904–10).

TRANSYLVANIA, Prince of. See Bethlen Gabor.

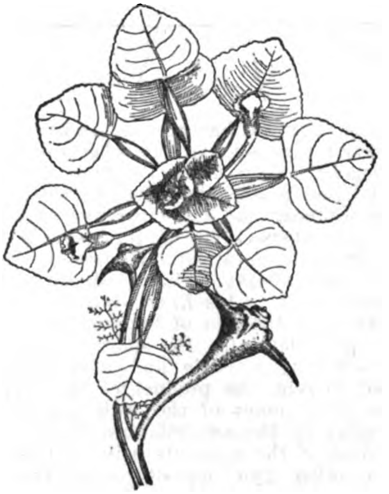
TRANSYLVANIA COLLEGE. An institution for higher education founded in Lexington, Ky., in 1798. It succeeded Transylvania Seminary, which was chartered in 1783. The seminary was located near Danville, Ky., but was removed to Lexington in 1789. It was consolidated with Kentucky Academy and the name changed to Transylvania University in 1798. Gifts to its endowment fund were given by George Washington, John Adams, Aaron Burr, John Jacob Astor, and General Lafayette. In 1865 Transylvania was consolidated with Kentucky University, the successor of Bacon College, and the institution took the name of Kentucky University. In 1908, however, the name Transylvania was resumed, and in 1915 the title was changed from that of Transylvania University to Transylvania College. The alumni of the college number more than 4000. In the autumn of 1915 there were 270 students, of whom 142 were preparing for religious vocations. The faculty numbered 24. The endowment at the end of the collegiate year was $499,249. The library contains 21,000 volumes. The buildings, grounds, and equipment were valued at $525,000, and the annual income amounted to $70,648. The president in 1916 was Richard F. Crossfield, LL. D.

TRANSYLVANIA UNIVERSITY. See Transylvania College.

TRAP (Ger. *Trapp*, from Swed. *trapp*, trap rock, from *trappa*, Ger. *Treppe*, stair; so called because often developed in steplike masses). A very general term, little employed in scientific language, but commonly used to designate dense and generally fine-grained igneous rocks of black or dark-green color. The term is almost synonymous with basalt (q.v.) or diabase (q.v.), but might include as well gabbro, norite, peridotite, pyroxenite, etc. When altered such rocks assume a green color from the hornblende, chlorite, epidote, or other secondary minerals developed in them, and they are then known as greenstone. Both greenstone and trap include a wide range of rock families, which by reason of their fine texture and often altered condition are difficult to determine without careful and generally microscopic study.

TRAP. See Plumbing.

TRA'PA (Neo-Lat., abbrev. of ML. *calcitrapa*, caltrop, from Lat. *calx*, heel + ML. *trappa*, snare, from OHG. *trappa*, *trapa*, AS. *træppe*, *treppe*, Eng. *trap;* so called from the four spines of some species, which thus resemble caltrops). A small genus of aquatic plants, the only representative of the family Hydrocaryaceæ, now generally placed in the family Haloragidaceæ. *Trapa natans*, the water caltrops, is found in ditches and ponds in southern Europe, is grown in ponds in Holland, and is found in a few places in Massachusetts and New York. The floating leaves are rhomboidal, toothed, and smooth; those under water are cut into capillary segments. The fruit has four spines; the large, almond-like kernels are edible, either raw or roasted or in soups, and taste somewhat like chestnuts; hence the French name *marron d'eau* (water chestnut). Nuts of *Trapa bispinosa*, the Singhara nut, being starchy, are widely used as food in Cashmere, where they are made into cakes, etc. *Trapa bicornis*, by some botanists considered to be a form of *Trapa natans*, is much cultivated in China for its edible fruit. Some botanists reduce all the species to one, with possibly several varieties.



CHINESE BUFFALO NUT (*Trapa bicornis*).

TRAPANI, trä′pȧ-nê. The capital of the province of Trapani, Sicily, situated on a peninsula of the northwest coast, 45 miles west by south of Palermo (Map: Italy, D 5). There are several fine churches with noteworthy sculptures and paintings, and palaces architecturally interesting. The lyceum has a picture gallery and a natural-history collection. The special industries are connected with the working of coral, shell cameos, marble, and alabaster. There are also shipbuilding yards, saltworks, fisheries, and an export trade in wine, fruits, olive oil, etc. The fine harbor, which is defended by a fort, is the scene of much commercial activity. Near the city is the ancient Annunziata pilgrimage church, with the famous statue of the Madonna of Trapani. Trapani, the ancient Drepanum and seaport of Eryx (q.v.), was fortified by the Carthaginians in the third century B.C. Here in 249 B.C. they defeated the Romans in a great naval battle. Eight years later, however, Trapani became a Roman colony. It was a royal residence in the Middle Ages. Pop., 1901, 59,452; 1911, 62,572.

TRAPDOOR SPIDER. Any one of the large hairy tropical spiders of the family Theraphosidæ, which make long tubes in the earth, lining them with silk and fashioning at the entrance a bevel-edged, hinged, accurately fitting trapdoor made of alternate layers of earth and silk. The upper surface is covered with earth or gravel so as to disguise the entrance. The spider hides in the nest when not seeking prey, and with some species a branch to the tunnel is built with a separate door.

The digging of the burrow (always on high sloping ground) is a laborious task. The earth is loosened with the mandibles and is carried away piece by piece supported by the mandibles and maxillæ. One observed took an hour to dig a hollow as large as half a walnut. A species common in the southwestern United States (*Ctenitza californica*) digs holes nearly an inch in diameter and sometimes a foot in length. When the spider is on guard, holding the door down from inside by means of its mandibles and feet, it is impossible to raise the trapdoor without tearing it. Experimenters at San Diego, Cal., removed the trapdoors of 60 nests, unhinging them at night. Without exception the spider had by morning completed a new door. Continued removal resulted in a falling off in the quality of the doors, owing to the failure of the spider's supply of silk. The fifth door made, by a single spider, was almost entirely of mud with hardly enough web to coat and hinge it. When the trapdoors were fastened down, a side branch with a new door was always made overnight with an opening near the original mouth. The nests are generally in pairs, but it is not known whether they are occupied by different sexes. The young hatch in the mother's burrow and live there for a few weeks; then they leave the nest and begin small tubes of their own. The food of these spiders consists largely of ants and other crawling wingless insects. They have been known to eat earthworms and large caterpillars. The trapdoor spiders of southern Europe make thin covers which rest loosely on the top of the hole, but they are covered with leaves or something of the sort in order to disguise them.

Consult: J. T. Moggridge, *Harvesting Ants and Trap-Door Spiders* (London, 1873); J. H. Emerton, *The Structure and Habits of Spiders* (Salem, Mass., 1878); H. C. McCook, *American Spiders and their Spinning Work*, vol. iii (Philadelphia, 1893); J. H. Emerton, *Common Spiders of the United States* (Boston, 1902); J. H. Fabre, *The Life of the Spider* (Eng. trans. by Alexander Teixeira de Mattos, New York, 1913); J. H. Comstock, *Spider Book* (new ed., ib., 1914).

TRAPE'ZIUM. As commonly defined in the United States, a quadrilateral of which no two sides are parallel. The distinction between trapezium and trapezoid was not always clearly made by Greek writers, but in general the word "trapezium" meant a quadrilateral having two parallel sides, and "trapezoid" meant a quadrilateral in general, ordinarily having no parallel sides. In England this is the present usage, a trapezium having two parallel sides and a trapezoid having no parallel sides. See QUADRILATERAL.

TRAP'EZOID (Gk. *τραπεζοειδής*, *trapezoeidēs*, shaped like a trapezium, from *τράπεζα*, *trapeza*, table, from *τέτρα-* *tetra-*, four + *πούς*, *pous*, foot + *εἶδος*, *eidos*, form). As commonly defined in the United States, a quadrilateral two of whose sides are parallel; but see the discussion under TRAPEZIUM. The parallel sides are called the bases. The area of a trapezoid is given by the formula $A = \frac{1}{2}(b + b')a$, where b and b' are the bases and a the altitude. See QUADRILATERAL.

TRAPP, JOHN (1601–69). A Puritan clergyman. He was born at Croome d'Abetot; graduated B.A. at Oxford (1622); was usher (1622–24), then headmaster of the free school at Stratford-on-Avon (1624–26); vicar of Weston-on-Avon, 2 miles from Stratford (1636–46); rector of Welford (1646–60); then went back to Weston, where he died. His fame rests upon his biblical commentaries, which furnish a specimen of Puritan Bible study at its best and are often both witty and wise. They were issued in a collected edition in 1662 et seq. and reissued, with a *Memoir* by A. B. Grosart, as *Commentary on the Old and New Testaments* (1865–68). Consult Spurgeon, *Commenting and Commentaries* (London, 1876).

TRAPPING (from *trap*, AS. *træppe*, *treppe*, OHG. *trappa*, *trapa*, trap, snare; connected with Ger. *Trappe*, flight of stairs, ladder). The taking of animals and birds by means other than the arrow, spear, or gun. The methods used may be divided into four classes: (1) the pit, the inclosure, and the heavy deadfall, for the largest animals, such as the bear and the lion, and the lighter deadfall and snap trap for smaller beasts, as wolves, foxes, and beavers; (2) the box trap, the switch-up, and various snap traps and snares for the lesser kinds of quadrupeds; (3) nets of various kinds with or without decoys and birdlime for birds; (4) nets and baskets for fish.

The pit is a hole in the earth, lightly covered and carefully concealed. It is placed where the game is likely to go voluntarily or where it may be drawn, either by judicious beating or by an enticing bait. The covering breaks and the quarry is caught in the pit. The kind of animal so caught varies with the country; e.g., the Arabs trap lions in pits. The inclosure is a space round which in Africa the heavy creeping vines from tree to tree have been woven together into rough hurdles, and in Asia the bamboo is similarly employed.

The heavy deadfall inclosure is a pen about 3 feet wide, 4 feet deep, and 5 feet high, made of logs driven into the soil. Four heavy corner posts hold transverse logs and the fall log. The principle of the trap is that when the bait is disturbed, say by a bear, a heavy log will fall upon the animal's back and crush its body against the lower log fixed across the front of the pen. To reach the bait the bear must enter the trap at least halfway. A slight forward pull releases the lower end of the bait stick and causes the fall log to drop. Sometimes the fall log is a heavy slab set up on bait sticks. The box trap is practically the deadfall, but, instead of the log falling on the captive, the box lid falls down on the box's sides and end and incloses the catch unhurt. This can be placed anywhere, even in a tree. For the switch-up a runway of the animal sought is selected, and on either side, a notched stick is driven projecting about 8 inches aboveground, with a crosspiece resting on the notches. A spring sapling about 5 feet long is then driven into the ground near by and its springy head bent over the crosspiece and fastened to it, after which a noose of brass wire is hung on it (or an overhanging branch of a tree may be used in the same way). The rabbit or other small animal hopping along the runway runs his head in the sliding noose; this grips his neck, and in his struggles he releases the crosspiece, which lets the sapling spring up to vertical, and the captive is lifted off its feet and strangled. The steel-spring trap is used for every kind of quadruped, from the bear to the rat. It is made of two jaws of steel, which when open lie flat on the ground harmless, but when the pan between them is depressed the spring forces the jaws together, generally catching the animal's leg.

Fish are trapped in many ways: by gill nets spread from stake to stake across the swims of the fish when they come from the sea, like shad, into the estuaries in the spring to spawn; or by other nets, set to catch fish migrating from the fresh waters to the sea, like salmon and trout. Similar ones are sometimes set under ice, near holes cut through it, towards which the fish will invariably come to the light. There is the cast net, a circular net with lead weights around its bottom edge, which when thrown and spread, by a twirl of the arm, into shallow water where a shoal of fish are, sinks rapidly at the full extent of the circle, and when drawn in by the caster pulls up all the fish within its area. Baskets are set for eels, into which they can crawl, but out of which they cannot return. Snares—or snigs, as they are sometimes called—will capture fish in shallow water, notably pike. They are wire nooses at the end of a rod which the snarer deftly slips over the head of the fish and tightens with a snatch. Snaring game fish is generally prohibited in the United States, and in most of the States seines or nets of any kind may be lawfully used only under rigid restrictions. Consult: Harding, *Wolf and Coyote Trapping* (Columbus, Ohio, 1909); E. Kreps, *Science of Trapping* (ib., 1909); F. H. Buzzacott, *Encyclopedia of the Hunter's and Trapper's Art* (2d ed., Chicago, 1913).

TRAP′PISTS. A branch of the Cistercian Order, following the reforms introduced in 1664 by Jean le Bouthillier de Rancé (q.v.). They take their name from the monastery of La Trappe in Normandy, of which Rancé was abbot when he began his reforms. They are among the most austere of Roman Catholic orders. The day in a Trappist monastery begins with matins in the church at 2 A.M., followed by a half-hour's meditation, and mass or study occupies the time until ten minutes to six. Then follows prime, and from 7.30 to 9 manual labor or instruction. At 9.45 terce, high mass, sext, and examination of conscience. Dinner is at 11, except on fast days, when it is an hour later. The hour after it is occupied by study in winter, but a siesta is conceded in summer. Work or teaching comes again from 2 to 4; vespers and meditation at 5, at 6 compline, at 7 supper, and bed at 8. The dinner consists of a small quantity of soup and vegetables with a pound of bread, a little fruit, and one glass of beer. The supper is of a similar nature, and those who need it are allowed a little milk, coffee, or broth on rising. The fasting season lasts from Holy Cross Day (September 14) until Easter. The Trappist sleeps in his habit, removing only his shoes. Only the superiors have separate rooms; each of the others has simply a curtained alcove in a dormitory. Perpetual silence is the most characteristic restriction imposed. It is absolute, unless he has the care of guests or needs to speak to his superiors; other communications are by signs. When sick, he is nursed in the infirmary; dying, he is carried into the church to receive the last rites in the presence of his brethren. The dead are buried in their habits, without coffins. Novices are received after two years' probation, and three years later may be professed. Besides the choir brothers, who are or mean to be priests, and the lay brothers, oblates are also received—persons who for some reason do not wish to take the vows, but conform to the rule during their residence.

The earlier houses of the order were nearly all in France; their expulsion from that country at the time of the Revolution and under the Third Republic has caused them to plant numerous monasteries in other countries. According to official statistics, in 1908 they had 4000 members in 71 monasteries. They have three houses in England, two in Ireland, nine in Belgium, five in Italy, five in Holland, three in Germany, four in Asia, two in Africa, and 10 in America, including four in the United States, five in Canada, and one in Brazil. The monasteries in the United States are located at Gethsemane, Ky.; New Malleray (near Dubuque), Iowa; Lonsdale, R. I.; Jordan, Oreg. They do not as a rule undertake the cure of souls, but conduct a few mission stations in South Africa, the Congo State, Japan, China, etc. Consult: C. Gaillardin, *Les Trappistes ou l'ordre de Citeaux au XIXme siècle* (2 vols., Paris, 1844); *La Trappe*, par un Trappiste de Sept-Fons (ib., 1870); F. Pfannenschmidt, *Geschichte der Trappisten* (Paderborn, 1874); Suchier, *Der Orden den Trappisten und die vegetarische Lebensweise* (2d ed., Munich, 1906). For the ordinary reader, the most vivid and accurate account of life in a Trappist monastery is in J. K. Huysmans, *En Route* (Eng. trans. by C. Kegan Paul, London, 1896).

TRAQUAIR, trăk′wâr, Ramsey Heatley (1840–1912). A British naturalist, born at Rhynd, Perthshire. He graduated at Edinburgh University and from 1873 to 1906 was keeper of natural history collections at the Royal Scottish Museum, Edinburgh. From 1883 till 1887 and again from 1896 till 1900 he was Swiney lecturer on geology in the British Museum. Traquair became a leading authority on fossil ichthyology. His publications include: *Structure and Affinities of the Palæoniscidæ* (1879); *Structure and Affinities of the Platysomidæ* (1879); *Report on Fossil Fishes Collected by the*

Geological Survey of Scotland in the Silurian Rocks of the South of Scotland (1900); *Les poissons Wealdiens de Bernissart* (1911).

TRARIEUX, Gabriel (1870–). A French dramatist and poet, born at Bordeaux and educated at the Lycée Condorcet. He was codirector of the review *L'Art et la Vie* (1896–98) and of the *Revue d'Art Dramatique* (1898–1901) and in 1903 was appointed dramatic critic of *La Revue.* Trarieux became a member of the central committee of the League for the Defense of the Rights of Man. He wrote: verse, *La chanson du prodigue* (1892) and *La coupe de Thulé* (1896); dramatic criticism, *La lanterne de Diogène* (1902); essays, *Les petites provinciales* (1904); and the following dramas: *Joseph d'Arimathie* (1898); *Sur la foi des traités* (1900); *Les vaincus; Hypatie; Savonarole* (1900); *La guerre au village* (1903); *L'Otage* (1907); *L'Alibi* (1908); *La dette* (1909); *Un soir* and *La brebis perdue* (both 1911); *L'Escapade* (1912).

TRARIEUX, Jacques Ludovic (1840–1904). A French advocate and Senator, father of Gabriel Trarieux (q.v.). He was born at Aubeterre, Charente, and became an advocate at Bordeaux, where he was elected a deputy in 1879. In the Chamber of Deputies he joined the Republican Left. He failed in the elections of 1881 and 1884, but was returned to the Chamber for Charente in 1885. In 1888 he was elected for Gironde to the Senate, where he sat with the Left Centre, and in 1897 was reëlected. Trarieux served in the Ribot cabinet in 1895. He was one of the four Senators who were charged with the prosecution of General Boulanger (see Boulanger, Georges Ernest) before the High Court, and he was also active in the revision of the Dreyfus case (see Dreyfus, Alfred), being the founder and first president of the League for the Defense of the Rights of Man (Ligue pour la Défense de l'Homme et du Citoyen).

TRASIMENO, trä′sė-mä′nō, Lago (Lat. *Trasimenus Lacus*), or Lago di Perugia. A lake in Italy, lying between Cortona and Perugia (Map: Italy, D 3). It is about 10 miles in length by 8 in breadth; the greatest depth is not above 30 feet. The lake has no apparent outlet, and the margins are flat and overgrown with reeds. It is surrounded on all sides by hills, those on the north side, extending from Cortona to the lake, being known as Gualandro Hills—the *montes Cortonenses* of Livy. They are covered at the present day with oaks, vineyards, and olive plantations. The lake is memorable chiefly for the great victory obtained by Hannibal in 217 B.C., during the Second Punic War, over the Romans under Flaminius. Consult Livy, xxii, 3–6.

TRASK, Spencer (1844–1909). An American banker and philanthropist, born in Brooklyn. He graduated from Princeton in 1866 and entered the Wall Street banking house of H. G. Marquand. In 1881 he established the firm of Spencer Trask & Co., which became well known in finance, having branch houses in Philadelphia, Albany, and Providence. He early saw the value of Edison's experiments and became one of the inventor's supporters, as president of the Edison Electric Light Company and director in numerous companies manufacturing the Edison products. He was also identified with many other corporations and with railroads, reorganized the New York *Times,* was a patron of art, and built St. Christina's Home for children at Saratoga. He was deeply interested in municipal reform and in local Democratic politics. He was killed in a railroad collision. Spencer Trask did much to restore to popularity the mineral waters at Saratoga, and in 1915 an elaborate memorial was erected there in recognition of this service. His wife, Kate Nichols ("Katrina") Trask, became well known as an author.

TRASTAMARE, Henry II of. See Henry II of Trastamare.

TRASTEVERE, träs-tā′ve-re. A district of Rome about the Janiculum, which was annexed to the city by Augustus as the *Regio Transtiberina.* In Imperial times it was the abode of street peddlers and during the Middle Ages was frequented by foreigners. It is now almost entirely inhabited by the working classes. Many valuable antiquities have been recovered in the district, among them the Apoxyomenos (q.v.) of Lysippus. Consult K. Baedeker, *Central Italy and Rome* (15th Eng. ed., Leipzig, 1909).

TRAU, trou. A town of Dalmatia, Austria, on the Adriatic, 12 miles west of Spalato (Map: Austria, E 5). It is interesting for its remains of Venetian domination, including a thirteenth-century cathedral. Pop., 1910, 3507.

TRAUBE, trou′be, Ludwig (1818–76). A German clinician, born at Ratibor, Silesia. He studied at the universities of Breslau, Berlin (M.D., 1840), and Vienna. He became lecturer at the University of Berlin in 1849 and for many years was connected with the Charité Hospital. In 1862 he was made professor at the Friedrich-Wilhelm Institute and in 1872 professor at the university. Traube was especially noted for his experiments on animals for the purpose of demonstrating pathological conditions. The practice of auscultation and percussion was greatly promoted by him, and he also made important studies regarding diseases of the heart, kidneys, and lungs. He published, among other works, *Gesammelte Beiträge zur Pathologie und Physiologie* (1871).

TRAUMAT′ROPISM (from Gk. *τραῦμα, trauma,* wound + *τροπή, tropē,* a turning, from *τρέπειν, trepein,* to turn). The sensitiveness of plant parts to wounding, by reason of which they change their growth so as to curve away from the side wounded. This sensitiveness is especially manifested by roots; in which, however, severe wounding may produce a purely mechanical effect, overpowering the true irritable reaction, which is only manifest in response to slighter wounds. See Growth.

TRAUN, troun. A river of Austria. It rises on the Gross-Hochkasten in northwest Styria and, entering Upper Austria, traverses the Hallstättersee and the Traunsee (q.v.) and flows into the Danube a few miles below Linz. It is celebrated for its trout. Near the village of Roitham it forms a notable waterfall. Length, about 110 miles.

TRAUNSEE, troun′zā, or **GMUNDENERSEE,** gmụn′den-ẽr-zā. The largest lake of Austria after the Attersee (Map: Austria-Hungary, C 3). It lies in Upper Austria, at an altitude of 1376 feet, between Ebensee and Gmunden in the Traun valley, and is 8 miles long and 626 feet deep. Like the Attersee, it is situated amid impressive surroundings and is noted for its picturesqueness.

TRAUTENAU, trou′te-nou. A frontier town of Bohemia, situated 74 miles northeast of Prague, on the right bank of the Aupa, a tributary of the Elbe. It is the centre of the linen industry of the Riesengebirge and has in addition paper mills. Here occurred two engagements between the Prussians and Austrians, June 27 and 28, 1866. Pop., 1900, 14,791; 1910, 16,143.

TRAUTWINE, trout′wīn, John Cresson (1810–83). An American civil engineer, born in Philadelphia, Pa. In 1828 he began study in the office of William Strickland, whom he assisted in building the United States Mint at Philadelphia. Between 1831 and 1836 he was an engineer on several railways and in 1836–42 was chief engineer of the Hiawassee Railway, connecting Georgia and Tennessee. Trautwine helped to build the Canal del Dique, between the Bay of Cartagena and the Magdalena River, and he executed (1850) surveys for the Panama Railway, for the Lackawanna and Lanesborough Railway (1856), and for a railway route across Honduras (1857). He also planned a system of docks for Montreal. He wrote: *Method of Calculating the Cubic Contents of Excavations and Embankments* (1851); *Field Practice of Laying out Circular Curves for Railroads* (1851); *Civil Engineer's Pocketbook* (1872). The *Pocketbook* was long known as the "engineer's bible" and under the editorship of John C. Trautwine 2d and 3d passed through many editions and is still current.

TRAVAILLEURS DE LA MER, trȧ′vȧ′yẽr′ de lȧ mâr′ (Fr., Toilers of the Sea). A novel by Victor Hugo (1866), containing wonderful descriptions of the sea.

TRAV′ANCORE′. A native state of British India, lying territorially within the Province of Madras (Map: India, C 8). It occupies the western part of the extreme south end of the Indian peninsula and stretches from Cape Comorin northward along the coast to Cochin. Area, 7129 square miles. The coast, which is low and sandy, is lined with lagoons receiving numerous small streams. The land rises gradually to the crest of the Anamalay Mountains, which extend along the eastern boundary with an average altitude of 4000 to 5000 feet, rising in their highest peaks to over 8500 feet. The climate is hot on the coast; the rainfall is heavy, and the mountain slopes are covered with forests of valuable woods, such as teak and ivory.

Rice, the sago palm, and vegetables are among the principal products. Pepper, coffee, tea, coconut products, and timber are the chief articles exported. Travancore is one of the most progressive of the native states of India. Its chiefs for a long period have been highly qualified by character and education for their positions, government has been well administered, and a higher degree of prosperity has prevailed than has been common in India. The chieftaincy descends in the female line. The ruling family belongs to the Hindu race. A tribute of $400,000 is paid annually to the British in consideration of the protection which they afford. Pop., 1901, 951,038; 1911, 3,428,975, the great majority being Hindus. About one-fifth of the population are Syrian Christians. Trivandrum (q.v.) is the capital.

TRAV′ELER, The. A poem by Oliver Goldsmith (1764).

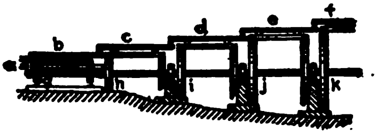
TRAVELERS, Law as to. See Carrier, Common; Highway; Rules of the Road; Ticket.

TRAVELER'S JOY. See Clematis.

TRAVELER'S TREE, or Ravenala (*Ravenala madagascariensis*). A remarkable plant of the family Musaceæ, a native of Madagascar. The stem resembles that of the plantain or banana, but sends out leaves only on two opposite sides. The lower leaves drop as the stem grows, and in old trees they are sometimes 30 feet in air. A tree often has 24 leaves, each leafstalk 6 or 8 feet long, and the blade 4 or 6 feet more. The blade of the leaf is oblong, bright green, and shining. The fruit is not succulent, but is filled with a brilliant blue or purple fine silky fibre, among which are 30 to 40 seeds. Forty or 50 fruits grow in a bunch, and three or four bunches may be seen at once on the tree. The leaves are used for thatch and for other purposes, and the leafstalks for partitions and often for walls of houses. The bases of the leafstalks usually hold water, even in the driest weather, more than a quart being readily obtained by piercing the thick part of the base. This water, used for drinking in case of need, has suggested the name. A second species, *Ravenala guyanensis*, occurs in South America.

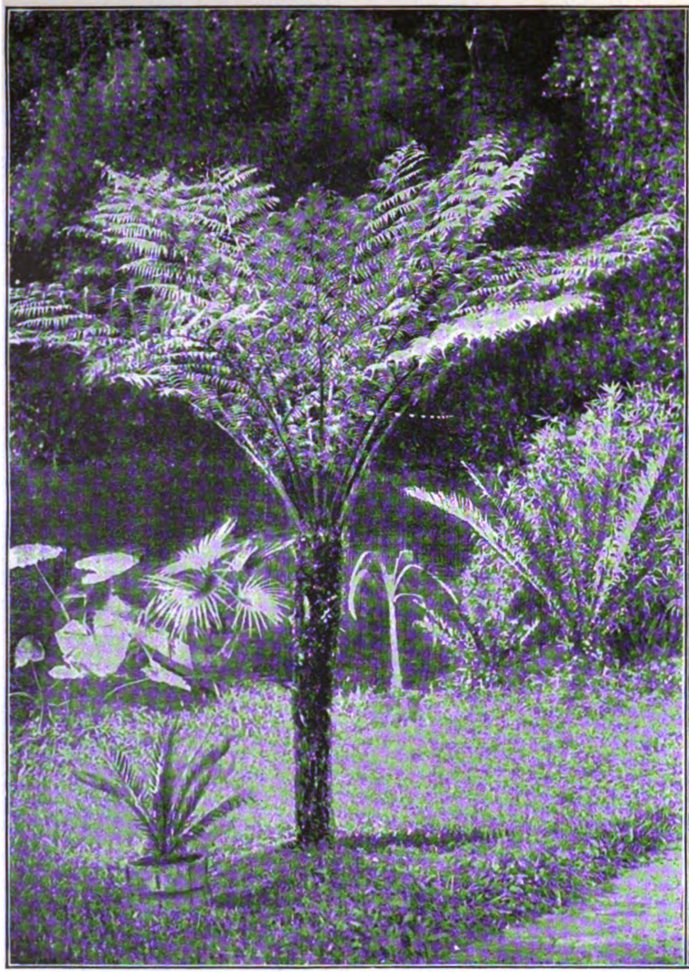
TRAVELING GRATES. See Shaking Grates; Stoker, Automatic.

TRAVELING SIDEWALK. An arrangement for the transportation of passengers, consisting essentially of a series of parallel, closely abutting platforms traveling on wheels or rollers at different speeds. A sidewalk of this character was installed at the Columbian Exposition at Chicago in 1893 to convey passengers from one part of the grounds to another, and similar structures have been employed at other expositions and elsewhere. The principle of operation of the traveling sidewalk may be readily understood by an explanation of the accompanying diagram. In this diagram *a*, *b*, *c*, *d*, *e*, and *f* are the parallel platforms. The platform *a* is stationary, but the others all travel by means of flexible rails riding on the rims of the wheels *g*, *h*, *i*, *j*, and *k*. These wheels rotate on a common shaft at the same number of rotations per minute, but, being of different diameters, they carry the superimposed platforms at different speeds; thus, platform *b* has, say, a speed of 3 miles per hour, *c* a speed of 6 miles, *d* a speed of 9 miles, *e* a speed of 12 miles, and *f* a speed of 15 miles. The platforms travel continuously, and a foot passenger desiring to use them steps from the stationary platform *a* onto the moving platform *b* and then onto *c*, *d*, *e*, and *f* in succession; the return to the stationary platform is made in a similar manner, but, of course, in the reverse direction. By having the difference between the speeds of any two adjacent platforms no greater than the speed of a brisk walk the transition from one speed of travel to the next higher or lower is accomplished without difficulty, and the pedestrian can board and leave the moving platforms at any point he may choose. It has been proposed, where the distances to be traveled are considerable, to have seats on the highest-speed section.

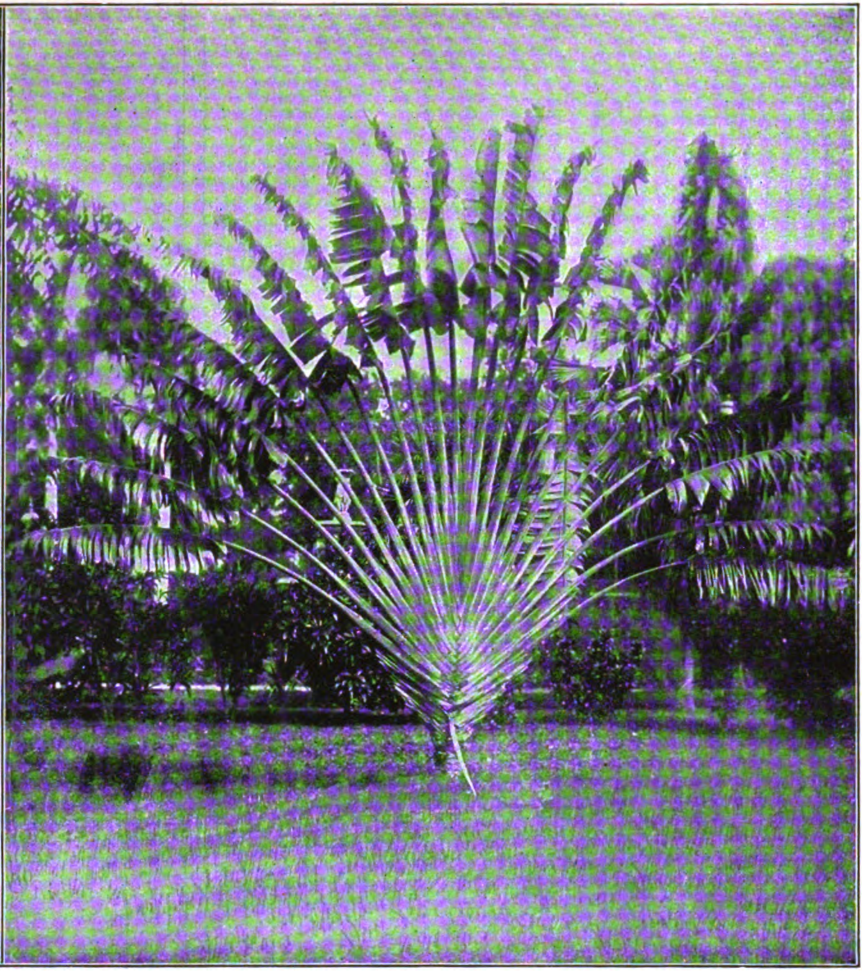


SECTION OF TRAVELING SIDEWALK.

TREE FERN AND TRAVELER'S TREE



TREE FERN



TRAVELER'S TREE

A traveling stairway is a similar arrangement placed on an incline, but supplied with but one moving platform. It is used for ascending to elevated-railway platforms and in large shops, and is called an escalator (q.v.). See Elevator, *Escalator*.

TRAVELING STAIRWAY. See Elevator, *Escalator*.

TRAVEMÜNDE, trä′ve-mụn′de. A town of Germany, the outport of Lübeck, lying 9 miles northeast of that city, at the mouth of the Trave (Map: Germany, D 2). It is a well-known watering place. The old walls of the town were torn down in 1882. Pop., 1900, 1849; 1910, 2174.

TRAVERS, Jerome D(unstan) (1887–). An American golf champion. He was metropolitan champion of New York for five years, and for three years held the New Jersey honors. The national amateur title, which he first won in 1907, he held in 1907, 1908, 1912, and 1913, losing to Francis Ouimet in 1914. In 1915 he won the national open title, playing 72 holes in 297 strokes. He published *Travers' Golf Book* (1913), and *The Winning Shot* (1915), with Grantland Rice.

TRAVERS, Morris William (1872–). An English chemist. He was born in London and studied there at University College and in France at Nancy. At the former institution he taught until 1903, was next professor of chemistry at University College, Bristol, and in 1906–14 was director of the Indian Institute of Science at Bangalore. His researches on gases at low temperatures are well known and include *Argon and its Companions*, with Sir William Ramsay; *The Liquefaction of Hydrogen* (1900); *The Experimental Study of Gases* (1901; Ger. trans., 1905); *Researches on the Attainment of very Low Temperatures* (1904); *Further Notes on the Self-Intensive Process for Liquefying Gases* (1906).

TRAVESARI, trä′vĕr-sä′rē, Ambrogio. See Ambrogio il Camaldolese.

TRAV′ERSE. In common-law pleading, a denial of facts alleged in a pleading. A traverse includes all pleadings by way of denial, whether made by the defendant or the plaintiff. See Pleading.

TRAVERSE (OF., Fr. *travers*, from Lat. *traversus*, *transversus*, lying across, transverse, p.p. of *transvertere*, to turn across, from *trans*, across, through + *vertere*, to turn). In fortification, a mass of earth projecting inward from, or flanking, the parapet, and designed to afford protection against oblique or enfilade fire or both. Traverses must not rise above the crest of the work, otherwise they would reveal the gun positions. In modern fortification they are employed only to a limited extent. In gunnery (q.v.) traverse describes the moving or pointing of a gun on its pivot, when taking aim, the gear by which the operation is accomplished being known as traversing gear. The platforms by which heavy naval or fortress guns and carriages are moved into position, or by which their direction is changed, are called traversing platforms. See Fortification.

TRAV′ERSE CITY. A city and the county seat of Grand Traverse Co., Mich., 60 miles northeast of Manistee, at the mouth of the Boardman River, on Grand Traverse Bay, an inlet of Lake Michigan, and on the Pere Marquette, the Grand Rapids and Indiana, the Traverse City, Leelanau, and Manistique, and the Manistee and Northeastern railroads (Map: Michigan, D 4). It possesses an attractive situation and good fishing facilities and enjoys considerable reputation as a summer resort. The Northern Michigan Insane Asylum is here, and there are two public libraries. Traverse City is situated in a noted cherry-growing region and is also extensively engaged in manufacturing. It is known for its production of oval wood dishes. Some of the other important manufactures are baskets, lumber, interior finishings, farm implements, shoes, cider, candy, flour, leather, fur coats and robes, furniture, foundry and machine-shop products, etc. The city has adopted the commission form of government. Traverse City was settled about 1850 and was chartered as a city in 1895. Pop., 1900, 9407; 1910, 12,145; 1915 (U. S. est.), 13,542.

TRAV′ERTINE (from It. *travertino*, *tiburtino*, from Lat. *tiburtinus*, travertine, relating to Tibur, from *Tibur*, an ancient town of Latium, now called Tivoli). A massive or cryptocrystalline variety of limestone that is deposited from springs or rivers and usually has an irregularly banded structure owing to its mode of formation. A variety known as calc tufa consists of cellular depositions from the waters of small springs and often contains fossil leaves, twigs, etc. See Calcareous Tufa.

TRAV′ESTY (OF. *travesti*, p.p. of *travester*, to disguise, from Lat. *trans*, across, through + *vestire*, to clothe, from *vestis*, garment). A term applied in literature to denote a burlesque representation of something previously executed in a serious and lofty manner. It differs from parody (q.v.) in this respect: that while the latter changes the subject matter and the dramatis personæ, but mockingly imitates the style of the original, the former leaves the subject matter partially, and the dramatis personæ wholly, unaltered; producing a purely comic effect by the substitution of the mean, the frivolous, and the grotesque in action or speech, for the serious, the noble, or the heroic. See Parody.

TRAVIATA, trä′vī-ä′tȧ, La. An opera by Verdi (q.v.), first produced in Venice, March 6, 1853; in the United States, Dec. 3, 1856 (New York).

TRAV′IS, William Barrett (1811–36). An American soldier, born in Edgefield Co., S. C. After studying law he began practice at Claiborne, Ala., about 1830. He removed to Texas, then beginning the struggle for independence, in 1832 and at once took part in the insurrection. He was made a colonel in the revolutionary army and was captured by the Mexican forces, but was finally released. With about 150 men he defended the Alamo (q.v.) from Feb. 23 to March 6, 1836, against Gen. Santa Anna (q.v.) and about 5000 Mexicans. Desperate fighting continued until only Travis and five others were left. They surrendered on being assured that their lives would be spared, but by Santa Anna's orders they were all killed.

TRAWLING (from *trawl*, from OF. *trauler*, *troller*, *troler*, Fr. *trôler*, to ramble, stroll, drag about). One of two modes of deep-sea fishing or of exploration of the depths. In Europe a trawl or beam trawl is a triangular purse-shaped net, about 70 feet long, usually having a breadth of about 40 feet at the mouth. The upper part of the mouth is secured to a wooden beam which keeps the net open; this beam is supported on two upright iron frames, known as trawl heads or irons. The underside of the net is made with a deeply curved margin attached to the ground rope, the whole length of it in contact with the ground. A trawl has also generally two pockets, one on each side, made by lacing together the upper and under parts, so that fish turning back from the cod may be caught in them. The meshes vary in size from 4 inches square at the mouth to 1¼ inches square in the cod, or narrow hinder end of the net. Two stout ropes about 15 fathoms long are fastened to the trawl heads and form a bridle, to which is shackled a towing line 150 fathoms long. Trawling is generally in the direction of the tide and can be followed with advantage only on a sandy or other smooth bottom. The vessels employed on the Dogger bank and near the English coast vary in size from 35 to 60 tons. Many of these trawlers stay at sea for six weeks at a time in all seasons of the year, their fish being packed in ice, collected by fast-sailing cutters, and conveyed to market. Cod, haddock, etc., are caught in great numbers by trawling; some kinds of flat fish, as soles, are scarcely to be obtained by other means. Smaller trawl nets are used in bays and estuaries.

In the United States a trawl is a long line anchored on the fishing ground, from which depends a row of short lines carrying baited hooks. The device is principally used on the fishing banks. See Deep-Sea Exploration; Fisheries.

TREACLE (trē'k'l) **BIBLE.** See Bible, Curious Editions of.

TREACLE MUSTARD. See Erysimum.

TREADMILL. A machine where the weight of men or animals acting on a series of treads or steps arranged on a cylinder or endless band is employed to furnish power. The most general application of this machine has been to farming machinery, where horses and dogs are used to supply the motive power. The endless band formed by the treads is inclined and is connected with a flywheel, to which the machinery to be operated is connected by belting. The term "treadmill" is most generally applied, however, to a device formerly in general use in prisons in Great Britain for convicts sentenced to hard labor. It consisted of a wheel in the form of a long hollow cylinder, with steps around its circumference and a hand rail above the wheel, so that a prisoner might support himself while treading the steps and thus working the wheel. The desired resistance could be created by means of weights, or the motive power thus created utilized to grind grain, etc. The physical exercise was severe, and the use of the treadmill in British prisons, which had been gradually abandoned, was entirely abolished early in the twentieth century. The crank, a small wheel with paddles, which revolves in a box partially filled with sand or gravel, was substituted in some prisons where unproductive hard labor was necessary, but this also was abolished in a more enlightened penology. As the amount of work could be measured with accuracy, the treadmill was occasionally employed in physiological investigations.

TREADWELL, Aaron Louis (1866–). An American zoölogist, born at Redding, Conn., and educated at Wesleyan University (B.S., 1888; M.S., 1890) and at the University of Chicago (Ph.D., 1898). He was professor of zoölogy and geology at Miami University (1891–1900) and at Vassar College was professor of biology (1900–14) and thereafter professor of zoölogy. In addition, he was an instructor at the Marine Biological Laboratory at Woods Hole (1898–1906, 1913) and honorary curator of annulates at the American Museum of Natural History from 1909. His writings include a number of papers dealing chiefly with annelid systematics and embryology, the most important of the latter being *The Cytogeny of Podarke obscura* (1901). He contributed to the New International Encyclopædia.

TREADWELL, Daniel (1791–1872). An American inventor, born at Ipswich, Mass. Among his more important inventions are a power printing press; a system of turnouts for single-track railroads (1826); the gypsy, a hemp-spinning machine for the manufacture of cordage (1829); and a method of constructing cannon from wrought iron and steel according to a process said to resemble that invented later by Sir William Armstrong. (See Armstrong, William George, Baron.) Of these, the spinning machine was probably the most successful. In 1822, in conjunction with Dr. John Ware, he founded the *Boston Journal of Philosophy and the Arts*, and from 1834 to 1845 he occupied the chair of Rumford professor at Harvard. Treadwell had a taste for theology and was one of Longfellow's circle of friends, and is the theologian of the *Tales of a Wayside Inn*. He published: *The Relations of Science to the Useful Arts* (1855); *On the Practicability of Constructing a Cannon of Great Calibre* (1856); *On the Construction of Hasped Cannon* (1864). Consult biographical sketch by M. Wyman in *Memoirs of the American Academy of Arts and Sciences*, vol. xi (Cambridge, 1888); also Samuel Longfellow, *Life of Henry Wadsworth Longfellow* (Boston, 1886).

TREADWELL, Frederick Pearson (1857–). A chemist, long resident in Switzerland. He was born in New Hampshire, but early went abroad and studied chemistry at Heidelberg, where he received the degree of Ph.D. in 1878 and served as assistant to the great Bunsen (q.v.). In 1883 he went to Switzerland and became assistant to Victor Meyer (q.v.) at the Technical School in Zurich. There he had become professor by 1894. With Meyer he published *Tabellen zur qualitativen Analyse*, but he is best known for his *Lehrbuch der analytischen Chemie* (2 vols.) which passed through many editions and was translated into several languages, the English version being widely used as a textbook in American universities.

TREASON (OF. *traison*, *traisson*, Fr. *trahison*, treason; from Lat. *traditio*, surrender, delivery, from *tradere*, to deliver over, betray). At common law there were two distinct classes of crime known as treason, termed respectively high treason and petit treason. The first was disloyalty to the sovereign or a violation of allegiance due him. The second was a violation of the allegiance due from an inferior to a superior, by taking the life of the superior, as of a wife to her husband, a servant to his master, or an ecclesiastic to his superior. Petit treason is now everywhere punished only as a homicide. High treason, being in effect treachery against the sovereign, was the highest crime a subject could commit. By the ancient common law, however, the crime was not clearly defined;

hence there was great latitude as to what was held by the judges to be treason. Thus, the accroaching, or attempting to exercise, royal power (a very uncertain charge) has been treated as treason; and killing the King's father or brother, or even his messenger, has also been so treated. The inconvenience of these constructive treasons led to the passing of the Statute of 25 Edw. III, c. 2, which attempted to define treason; and it was defined in five forms: (1) When a man compasses or imagines the death of the King, Queen, or their eldest son and heir. Under this clause it was held that the husband of a queen regnant was not included; but it includes a king de facto without regard to his title. The phrase "compassing and imagining the death of a king" has been held to mean the mere purpose or design, as distinguished from the carrying such design into effect; nevertheless, the purpose can be proved only by some overt act, such as providing weapons or ammunition for the purpose of killing the King, or assembling and consulting on the means to kill the King, although such acts might fall short of the legal definition of an attempt. The law has often, however, been strained; a paper found in a closet was held to convict Algernon Sidney (1683), though merely speculative in its character. (2) Another form of treason was the violating of the King's companion (i.e., wife), or his eldest daughter unmarried, or the wife of the King's eldest son and heir. (3) Another form was that of levying war against the King in his realm either by taking arms to dethrone the King or under pretense to reform religion or the laws; by resisting the King's forces; or by joining an insurrection. (4) It was also treason to adhere to the King's enemies in the realm by giving them aid and comfort, as by sending intelligence or provisions or selling arms to them. (5) Lastly, it was treason to slap the Chancellor, Treasurer, or the King's justices of the bench or in assize while in their places administering justice. Besides these specific forms of treason, the Statute of Edw. III enacted that, if there should be other cases not above specified, the judge should tarry without going to judgment, till the King and Parliament should judge it treason or other felony—which was a safeguard against the judges indulging too much in refinements about constructive treason. At a later period, between the reigns of Henry IV and Mary, the courts, nevertheless, returned to the practice of inventing constructive treasons and included as such the clipping of money, burning houses to extort money, refusing to abjure the Pope, etc. These and other newly invented treasons were totally abolished by a Statute of 1 Edw. VI, c. 12, but many of like nature were established under Elizabeth. A subsequent Statute of 1 Anne, c. 17, provided that whoever endeavors to hinder the next in succession under the Act of Settlement from succeeding to the crown is to be held guilty of treason; and whoever maliciously affirms another to have right to the crown otherwise than according to the Act of Settlement commits treason. Moreover, by 36 Geo. III, c. 7, whoever compasses or intends death or bodily harm to the person of the King is to be adjudged a traitor. The Act of 25 Edw. III, c. 2, was confirmed and made perpetual by 57 Geo. III, c. 6, which with the other statutes referred to embody the English statutory law upon the subject. There have been numerous statutes making certain specific acts treason, but most of these were repealed shortly after their enactment. The crime is neither a felony nor a misdemeanor, but a grade of crime by itself. All acting and abetting in the commission of treason are principals, there being no accessories in the crime of treason. See ACCESSORY; PRINCIPAL.

A copy of an indictment for treason and a list of the witnesses and jurors, together with the addresses of the latter, must be delivered to the prisoner 10 days before the trial, and he is entitled to have counsel assigned to defend him. This right, which prisoners accused of other crimes have not in English law, was conferred by a Statute of William III.

The punishment for treason was the most severe and revolting of the harsh punishments imposed by the common law. The traitor was to be drawn on a hurdle to the place of execution, hanged by the neck, his head then severed from the body, the body divided into four quarters, and the head and quarters to be at the disposal of the crown. But in 1870 these barbarities were abolished, and the penalty is now changed to execution by hanging. The consequence of a conviction of treason was also forfeiture (q.v.) and corruption of blood, the corruption of blood having the effect that the attainted person could neither inherit lands from his ancestors nor transmit them to any heir. But this was altered as regards England and Ireland in 1870 by the Statute of 33 and 34 Vict., c. 23. The convict suffers forfeiture and is disqualified for any public office; the court may order him to pay the costs of his conviction, and his whole property is transferred to administrators named by the crown, who administer it and retransfer the surplus to his heirs and representatives.

There are certain minor offenses which are called misprision of treason, being those closely bordering on treason. (See MISPRISION.) Such are offenses which consist in the bare knowledge and concealment of treason, without any degree of assent thereto, for any assent makes the party a principal traitor. The punishment of misprision of treason was loss of goods and lands during life.

In the United States treason may be either against an individual State or against the United States. In the former case it may be an offense at common law, although the constitution or statutes of most of the States define the crime and provide a punishment. Most of these provisions, however, are modeled after the provisions of the United States Constitution defining treason. The Constitution of the United States (Art. III, Sec. 3) provides that treason against the United States shall "consist only in levying war against them, or in adhering to or giving aid and comfort to their enemies." It is further provided that no person shall be convicted of treason unless on the testimony of two witnesses to the overt act or upon confession in open court. The penalty is death or imprisonment and fine at the discretion of the court. Levying war within the meaning of this provision must be a defiance of public government by armed force and must amount to more than a mere riot or an interference with the execution of the laws for some private purpose. The acts of the defendant must also proceed beyond mere preparation, as by enlistment of men for military service. They must meet or be assembled for a treasonable purpose and some act done towards executing with force their purposes. Thus, an assembly of men arrayed in a military manner for the purpose of overawing the public and finally assailing the government is levying war upon the government, although no actual blow is struck. Adhering to or giving aid and comfort to the enemies of the United States means more than mere sympathy with enemies of the government; it must be the voluntary giving of actual assistance to those who are waging war against the United States.

Most of the State constitutions contain provisions similar to the clause of the United States Constitution, defining treason against the State and providing a punishment. Generally they provide that treason against a State may be committed by armed opposition to its laws or by forcibly attempting to overthrow or usurp the government. In practice, the common law of crime and the statute law of crime in the several States have been found adequate to punish crime of a treasonable nature without resorting to prosecution for treason, and there have been few prosecutions for the specific offense of treason against a State. Consult authorities referred to under CRIMINAL LAW. Cf. PRÆMUNIRE. See ATTAINDER.

TREASURE ISLAND. A stirring tale of adventure by Robert Louis Stevenson (1883).

TREASURER, LORD HIGH. Formerly the third great officer of the crown in England, who was sole head of the King's exchequer. The office was originally held by one person, but in 1612 James I put it in commission; and from the accession of George I (1714) down to the present time it has been the practice to vest the office in a board of Lords Commissioners of the Treasury.

TREASURE-TROVE (*treasure*, from OF. *tresor*, Fr. *trésor*, It., Sp. *tesoro*, from Lat. *thesaurus*, from Gk. *θησαυρός*, treasure + *trove*, from OF. *trover*, *trouver*, Fr. *trouver*, to find). In the common law of England, hidden treasure of gold, silver, and bullion accidentally found in the earth, the owner of which cannot be ascertained. Treasure-trove belongs to the crown, and in certain districts the right to claim it has been granted to the nobility. In order to come within this rule, the treasure must be concealed, as distinguished from that which is casually lost and remains on the surface, as to which a different rule applies. A finder of treasure-trove is bound by law to give notice of his discovery to the proper officials of the crown, and failure to do so may subject him to fine and imprisonment. The present policy of the English government is to allow a finder to keep treasure thus discovered, less a small percentage of its value to be paid to the crown, unless it is valuable as an object of historical or antiquarian interest, in which cases it is claimed by the crown in order to be preserved in the national museums. By the Treasure-Trove Act of India, if no owner is found, the finder is entitled to three-quarters and the owner of the ground to one-quarter of its value. Though there are dicta to the effect that the common law as to treasure-trove applies in the United States, such a right is seldom, if ever, enforced. See FINDING.

TREASURY, DEPARTMENT OF THE. The executive department of the government of the United States controlling the national finances. It was established by Act of Congress in September, 1789, and was the successor of the Treasury Department created by the Congress of the Confederation in 1781, of which Robert Morris was for a time superintendent. It is the most extensive and complex of the departments and in rank stands next to the Department of State. At its head is the Secretary of the Treasury appointed by the President, who is a member of the cabinet and receives a salary of $12,000. He is second among the cabinet officers in the line of succession to the presidency. The department as originally established consisted of a Secretary, a Comptroller, an Auditor, a Treasurer, a Register, and an Assistant Secretary, together with a few clerks. From this the department has grown to be a vast establishment employing some 5000 persons at Washington, with numerous bureaus, branches, and offices throughout the country. The only qualification for the office of Secretary of the Treasury is the negative one that he shall not be interested in foreign commerce. He is required to digest and prepare plans for the revenue and public credit, to prescribe forms for keeping the public accounts, to superintend collection of the revenues, to grant all warrants under certain limitations for moneys issued from the Treasury in pursuance of appropriations made by law, and, in general, to perform such duties relative to the finances of the United States as shall be required by law. Simultaneously with the development of the country the duties of the department have been extended to the management of the national debt, the supervision of the national banks, the internal-revenue system, the legal-tender currency, the merchant marine, the lighthouse system, the life-saving and public-health services, the Coast Survey, etc. The Secretary is ex officio a member of the Federal Reserve Board. He is aided by three Assistant Secretaries. The business of the department is distributed among the following offices and bureaus: the Comptroller of the Treasury, six Auditors, the Treasurer, the Register, the Comptroller of the Currency, the Commissioner of Internal Revenue, the Mint, the Bureau of Engraving and Printing, and the Public-Health Service.

The Comptroller of the Treasury, since 1894, has been aided by an Assistant Comptroller. He exercises a kind of supervisory power over the Auditors, countersigns warrants drawn by the Secretary of the Treasury, etc. He is ex officio a member of the Federal Reserve Board. The original act creating the Treasury Department provided for a single Auditor; four additional Auditors were provided in 1817, and a sixth was added in 1836. The six Auditors are assigned to the Treasury, War, Interior, Navy, Post-Office, and State and other departments respectively, with the duty of examining accounts. The Treasurer is charged with the duty of signing the paper currency and of receiving and keeping the moneys of the United States and with disbursing the same on warrants properly drawn and countersigned. There are Assistant Treasurers at New York, Boston, St. Louis, Philadelphia, New Orleans, Baltimore, Cincinnati, Chicago, and San Francisco. The Register signs all stocks and bonds and all Treasury notes and coin certificates issued under the authority of the United States. The Comptroller of the Currency enforces the provisions of the national banking laws and superintends the issue of bank-note currency. At the head of the Bureau of Internal Revenue is a commissioner who is charged with the enforcement of the internal-revenue laws and the collection of the internal revenues. He is aided by a collector in each revenue district. For the collection of the customs there is a collector in each district, a surveyor in the larger ports, and a general board of appraisers to hear appeals against decisions of the collectors with regard to the dutiability of imported goods. The Director of the Mint has the supervision of all mints and assay offices throughout the country and makes annual reports to Congress on the coinage of the country, the yield of precious metals, etc. The Bureau of Engraving, established in 1874, has charge of the preparation of designs, stamps, bank notes, bonds, Treasury drafts, and other securities of the United States. The Solicitor of the Treasury has charge of all legal measures to prevent the evasion of the revenue laws and the counterfeiting of the coin and other securities of the United States.

TREASURY NOTE. A certificate of credit issued by the Treasury Department on the authority of the government and made receivable for government dues. In the United States treasury notes bearing interest were issued at different times before the Civil War, but it was during that struggle that the financial necessities of the government first led to the issue of very great quantities of noninterest-bearing Treasury notes, which, however, were made legal tender for all public and private debts except duties upon imports and interest on the public debt. See MONEY.

TREAT, ROBERT (1622–1710). A Colonial Governor of Connecticut, born in England. He emigrated to America with his father and settled in Wethersfield, Conn. In 1639 he settled in Milford, from 1653 to 1659 was a deputy, and from 1659 to 1664 was an assistant. He opposed the union of the Connecticut River and New Haven settlements and went with the dissatisfied faction which founded Newark, N. J. In 1672 he returned to Milford and later distinguished himself in King Philip's War. In 1676 he was chosen Deputy Governor of Connecticut and in 1683 was elected Governor and, with the exception of the two years in which the Colony was under Sir Edmund Andros (1687–89), served until 1698. From the latter year to 1708 he was again Deputy Governor. He was a zealous guardian of popular liberty in the Colony as against the interference and encroachments of Sir Edmund Andros (q.v.).

TREATIES, INDIAN. The first step of the United States government in determining its policy in regard to the Indians, whether expressed or implied, was to decide as to the nature of their territorial rights, this being the chief and altogether the most important factor in their relations with the whites. The decision reached on this point is distinctly stated by the United States Supreme Court in the case of Johnson and Graham's Lessee *v.* McIntosh (8 Wheaton, 453 et seq.), as follows: "It has never been contended that the Indian title amounted to nothing. Their right of possession has never been questioned. The claim of the government extends to the complete, ultimate title, charged with the right of possession, and to the exclusive power of acquiring this right." The next step was to determine the branch of the government to carry out this policy. By the ninth of the Articles of Confederation it was declared that "the United States in Congress assembled have the sole and exclusive right and power of regulating the trade and managing all affairs with the Indians not members of any of the States."

It is evident, therefore, that, while acting under the Articles of Confederation, the right of managing and controlling the relations with the Indians resided in Congress alone. When the Constitution was framed this authority was conferred upon the legislative department in the following brief statement: "To *regulate commerce* with foreign nations and among the several States, and with the *Indian tribes*." It is apparent, from the use of the term "tribes," that the framers of the Constitution had in contemplation the method of dealing with the Indians as tribes through treaties. This is clearly shown by the Act of March 1, 1793, in which it is stated that no purchase or grant of lands from the Indians shall be of any validity "unless the same be made by a treaty or convention entered into pursuant to the Constitution." This action of Congress necessarily placed the initiatory steps in dealing with the Indians under the jurisdiction of the President as the treaty-making power, subject to confirmation by the Senate.

The Colonies and also the mother country had treated with the Indians as "nations," their chiefs or sachems often being designated as "kings"—and this idea was ingrafted into United States policy. It must also be remembered that the Colonies were weak, the Indian tribes comparatively strong and capable of requiring recognition of equality. Notwithstanding the evident anomaly of such a course, the growth in numbers and strength of the whites, and the diminishing power of the natives, this implied equality was recognized in dealings between the two until the Act of March 3, 1871. During all this time Indian titles to lands were extinguished only under the treaty-making clause of the Constitution; and these treaties, though the tribe may have been reduced to a small band, were usually clothed in the same stately verbiage as the most important treaty with a great European power. From the formation of the government up to March 3, 1871, 653 treaties were made with 97 different tribes or recognized tribal organizations.

It was ordered by this Act of March 3, 1871, that "No Indian nation or tribe within the territory of the United States shall be acknowledged or recognized as an independent nation, tribe, or power with whom the United States may contract by treaty," thus terminating a legal fiction that lasted nearly 100 years. It appears, from the Annual report of the Commissioner of Indian Affairs for 1890, that the Indian title to all the public domain had been extinguished, except in Alaska, in the portions included in 162 reservations, and those acquired by the Indians through purchase. As the title to reservations is derived in most cases from the United States, and title by purchase is derived directly or indirectly from the same source, it may be stated that the Indian title to all the public domain, except in Alaska, had practically been extinguished by the year 1890. It would seem, in fact, that the United States government proceeded on the theory that all the lands within its bounds were held by the natives, and hence that their possessory right must be extinguished. The only known variation from this rule was in the case of the Uintah Utes, where an omitted portion of their claimed territory was taken possession of without agreement.

A natural corollary of land cessions by the Indians to the United States government was the establishment of reservations for these natives either within the limits of the original territory or elsewhere. These were the restricted areas to which the Indians were confined in order to bring them more directly under the control and care of the government and to lessen the liability of conflict with the whites and warring between the tribes. It was hoped also that by thus curbing the wandering habit these reservations might become the first step towards civilization. This policy (also followed in Canada under both French and English control) was inaugurated by the government as early as 1786 and continued as an established policy to the present day. The earliest reservations were chiefly formed as the result of the cession of lands by the tribes, thus restricting their limits, but expressly stating in the treaty defining the bounds that the portion so limited was "allotted to" or "reserved for" the given Indians. (For a list of these, see INDIAN RESERVATIONS.) The method of establishing reservations has not been uniform—some being by treaty, some by executive order, and others by act of Congress. Those established by executive order, independent of the act of Congress, were not held to be permanent before the General Allotment Act of 1887, under which the tenure has been materially changed, and all reservations, whether by executive order, act of Congress, or treaty, are held permanent. Reservations by executive order under authority of an act of Congress are those which have been authorized or established by acts of Congress and their limits defined by executive order, or have been first established by executive order and subsequently confirmed by Congress.

Other respects in which the power of Congress intervenes in reference to Indian lands, or is necessary to enable the Indians to carry out their desires in regard thereto, are the following: 1. Allotments of land in severalty previous to the Act of Feb. 8, 1887, could be made only by treaty or by virtue of an act of Congress, but by this act general authority is given to the President for this purpose. 2. Leases of land, sale of standing timber, granting of mining privileges, and right of way to railroads are all prohibited to the Indians without some enabling act of Congress. On the other hand, it is obligatory on the government to prevent any intrusion, trespass, or settlement on the lands of any tribe of Indians except where their consent has been given by agreement. Consult C. C. Royce, "Indian Land Cessions in the United States," in *Bureau of American Ethnology, Eighteenth Annual Report*, part ii (Washington, 1902).

TREATY (OF. *traite*, *traicte*, Fr. *traité*, It. *trattato*, treaty, from ML. *tractatus*, treaty, agreement, from Lat. *tractare*, to treat, manage, frequentative of *trahere*, to draw, drag). A compact or agreement entered into between the governments or sovereigns of two or more states. A treaty is somewhat analogous to a contract in private law, the main differences being in the origin, purpose, and manner of enforcement. Thus, a treaty is concluded with more formality than a private contract, its purposes are usually of a public character, while its enforcement rests chiefly upon the good faith of the contracting parties. The right of entering into treaty relations is one of the essential attributes of sovereignty and is therefore not usually permitted to so-called dependent states except under certain restrictions, nor to the component members of states having the federal system of government. So-called dependent states frequently retain the right of making commercial and extradition treaties, postal and customs conventions, and sometimes treaties of alliance and of naturalization. Component members of confederate states usually retain a considerable degree of treaty-making power, as, e.g., the members of the German Bund of 1815–66 or the States of Argentina (q.v.). Under the present German Empire the individual states enjoy the power to make treaties only with their immediate foreign neighbors, and only concerning postal and telegraph communication across the boundary between them. The Commonwealths of the United States are expressly forbidden to enter into treaty relations with foreign states or to make agreements among themselves except with the consent of Congress. The treaty-making power of a country is determined by its constitution. In the United States it is vested in the President, acting by and with the advice and consent of the Senate, two-thirds of the members concurring. The President exercises this power through the Department of State or through special plenipotentiaries appointed for the purpose. In monarchical countries the treaty-making power is usually a prerogative of the crown, but an indirect influence is frequently exercised by the Legislature, especially when an appropriation of money is necessary to carry into effect the stipulations of the treaty. In the German Empire treaties which relate to any subject already regulated by Imperial law require the approval of the Legislature. In the French Republic the President is empowered to negotiate treaties; but if the treaty is one of peace or commerce, or involves the finances or the territory of the state, or relates to the personal or property rights of Frenchmen in foreign states, the approval of the two Chambers is necessary. With the few exceptions of this kind, the negotiation and ratification of treaties in the European states are in the same hands, but they are distinct and separate steps, and ratification may be withheld after the treaty has been negotiated. Everywhere formal ratification is essential to the validity of a treaty.

In the United States, where the negotiating and ratifying authorities are in different hands, the question of ratification assumes a double importance, for it by no means follows that ratification is a matter of course. In several notable instances treaties negotiated by the President have been rejected by the Senate. Foreign governments, therefore, negotiating with the President of the United States are presumed to know that negotiation is only the initial stage in the procedure. The Senate has, moreover, claimed the right, and has exercised it in several instances, of ratifying only a part of a treaty instead of sending it back as a whole for revision. An important question has arisen in the United States as to whether Congress is bound to enact the necessary legislation to carry into effect the stipulations of a treaty negotiated by the President and duly ratified by the Senate. This question first arose in 1794 in connection with the unpopular Jay Treaty (q.v.), which called for an appropriation of money to carry it into effect. The House of Representatives was at first inclined to refuse its concurrence and gave in only after a sharp struggle, and then by a very close vote. It is impossible to say even now that the question has been decided one way or another. The rule now is to lay reciprocity treaties before Congress for its approval and for the enactment of the necessary legislation to carry them into effect. This practice has been followed in the case of reciprocity treaties with Mexico, Canada, and Cuba.

The question has also been raised as to how far the government is bound by the action of its negotiator provided he has not exceeded his instructions. Formerly the rule prevailed that if the plenipotentiary acted in accordance with his full power his principal was bound by his action, since the knowledge of the full power by the other party was a motive which induced him to negotiate. Some writers, following the doctrines of the Roman law, still hold that the principals are in good faith bound by the acts of their duly authorized plenipotentiaries. Others make a distinction in this respect between treaties proper and contracts, holding that, in view of the magnitude of the interests involved in agreements between states and the possibility of errors of judgment or of policy on the part of negotiators, a right of examination and of rejection is indispensable. It is now universally conceded that the principal may withhold his ratification from treaties negotiated strictly in pursuance of instructions where it is found to be impossible from physical or other reasons to fulfill their stipulations, or on account of mutual error by which both parties were misled, or where a change of circumstances upon which the validity of the treaty was made to depend has occurred, or where ratification of the treaty would involve injury to a third party.

The extent of the treaty-making power unless restricted by the constitution is almost unlimited. It includes the acquisition of foreign territory, the disposal of domestic territory, the recognition of new states, the creation of servitudes, the formation of alliances, the granting of special privileges with respect to trade, commerce, and residence, the delimitation and rectification of boundaries, the guarantee of territorial integrity, the neutralization of ship canals, etc. It is a common provision in European constitutions to restrict the treaty-making power with regard to the cession of domestic territory by requiring the approval of the legislature in such cases. A constitutional question has been raised in the United States as to whether the treaty-making power extends to the alienation of land belonging to a State, and on this point constitutional lawyers differ in opinion, but the better view seems to be that where doubt exists as to the right of a State to land which it claims the disputed territory may be ceded by treaty. On the other hand, it is contended that land to which the right of the State is undisputed cannot be disposed of without the consent of the State except in case of conquest, where transfer is inevitable as a means of terminating the war.

The usual conditions essential to the validity of a treaty are, first, that the contracting parties shall possess the requisite capacity for entering into treaty engagements. Thus, neutralized states are lacking in the capacity to enter into treaties which contemplate the waging of offensive war. In the second place, the plenipotentiaries who negotiate the treaty must be properly authorized. In the United States the President rarely if ever participates directly in the negotiations. This duty generally devolves upon the Secretary of State, although not infrequently the work is intrusted to a minister resident or to a special plenipotentiary or commissioner. Agreements entered into in excess of their authority are invalid and ratification may be withheld. An unauthorized agreement is called a sponsion and is of no effect unless approved by the sponsor's government. The third essential to the validity of a treaty is freedom of consent on the part of the signatory powers. If either party acts under constraint the resulting agreement is void except in the case of treaties or other agreements arising in the course of war, where from the nature of the case the element is present. But an error as to the value of a consideration such as may result from imperfect geographical knowledge with regard to a boundary will not affect the validity of the treaty. Finally, treaties which stipulate for the execution of objects which are physically impossible of execution, which are repugnant to the usages of international law, or which conflict with previous engagements with other powers are held to be invalid. Thus treaties stipulating the establishment of slavery, assuming joint control over a portion of the high seas, or impairing the sovereignty of a third power would be invalid.

Treaties are susceptible of classification along different lines. Vattel classifies them as equal and unequal, or those in which the reciprocal considerations are equal and those in which they are unequal; personal treaties, which expire with the death of the sovereign who contracts them; and real treaties, which bind the state permanently. De Martens follows the same arrangement, but adds transitory conventions and mixed treaties. Calvo distinguishes treaties, with reference to their form, into transitory and permanent; with reference to their nature, into personal and real; with reference to their effects, into equal and unequal and simple and conditional; and, finally, with reference to their objects, into treaties of guarantee, commerce, neutrality, alliance, etc. Hall arranges them as follows: (1) those which are declaratory of the law as understood by the contracting parties; (2) those which stipulate for practices which the contracting parties wish to incorporate into the usages of law, but which they know to be outside the actual law; (3) those which are, in fact, mere bargains, in which, without any reference to legal considerations, something is bought by one party at the price of an equivalent given by the other.

Cartels, capitulations, and suspensions of arms, or truces, are sometimes involved in the classifications of treaties, although strictly speaking they are not treaties. Transitory agreements or conventions are treaties which contemplate the immediate execution of the stipulations and which are complete when this act has been performed. Examples are treaties of delimitation, of cession, etc. Permanent treaties are those which are continuous in effect, either perpetually or for a specified period. Such are treaties of amity and commerce, of neutrality, of extradition, postal and customs conventions, etc. Cartels are agreements entered into in time of war between the commanders of opposing armies for the purpose of effecting an exchange of prisoners, and they may be transitory or for the period of the war. Capitulations are similar agreements for the surrender of a place, fleet, or army. Every general commanding is presumed to have authority to enter into agreements of this kind subject to any restrictions that may be imposed by the authority of his own state.

A treaty of alliance is an agreement between two or more states with a view to concerted action for a certain purpose. It may be temporary or permanent, equal or unequal, and offensive or defensive or both. Defensive alliances are usually formed with a view to preventing armed aggression against either party while offensive alliances are formed for the purpose of waging war against another state or states. A good example of the first class was the Treaty of 1778 between the United States and France, while the alliances formed among various European states to curb the ambitions and aggressions of Louis XIV and Napoleon I were in form examples of offensive alliances, although defensive in character. Treaties of guarantee are entered into for the purpose of securing the observance and execution of already existing treaties or for the maintenance of certain existing conditions for a limited period or in perpetuity. Among the conditions which have been made the subject of guarantee may be mentioned the independence and territorial integrity of states, as, for example, Greece in 1832 and the Ottoman Empire in 1856; the neutralization of states, as in the case of Belgium and Switzerland; the neutralization of ship canals, as in the case of the Suez and Panama canals; the free navigation of rivers; and the payment of state debts.

What are known as reciprocity treaties have been the subject of frequent negotiations in recent years, on account of the increasing importance of international commercial relations. Such treaties provide for reciprocal commercial advantages, usually in the form of reduced customs tariffs on the products of each state when imported into the other. They are usually entered into for limited periods of time and are sometimes subject to revision at stated periods. According to the older usage, in 1916 still followed by the United States, the special privileges granted by reciprocity treaties cannot be claimed of right by other nations simply because they have treaties entitling them to the same privileges as are allowed to the most favored nation. The basis for refusal to grant such privileges is that the nation demanding them is not able to offer in return the same advantages as the nation to which the privileges have just been given. According to European usage, such special privileges are forthwith accorded to nations having most favored nation treatment. Treaties of peace resemble ordinary treaties in form and in substance, but differ from them as regards the position of the contracting parties, since the element of duress is usually present in the negotiations, and hence freedom of conduct is not one of the requisites to the validity of such treaties. See War.

As regards the preparation of treaties, it has already been said that the ordinary method of negotiation is by a regular agent or commissioner. During the nineteenth century, however, the preparation of a number of the most important European treaties has been intrusted to general international congresses or conferences composed of ambassadors and in some cases of the sovereigns of the states concerned. Such were the Congress of Vienna of 1814–15 (see Vienna, Congress of), called to settle the questions growing out of the Napoleonic wars; the Congress of Aix-la-Chapelle in 1818 (see Aix-la-Chapelle), which terminated the military occupation of France; the Congress at Paris in 1856 (see Paris, Treaties of), which effected a partial settlement of the Eastern Question at the close of the Crimean War and drew up a declaration relative to the usages of maritime warfare; the Congress of Berlin of 1878 (see Berlin, Congress of), in respect to the questions growing out of the war between Turkey and Russia; and the Congress of Bucharest in 1913 called to settle the terms of peace after the second Balkan War.

The language employed in the preparation of treaties was formerly Latin. Towards the close of the seventeenth century it was replaced by French, which is now the general diplomatic language of Europe and America. Each signatory power may insist upon the use of its own language, in which case a copy is prepared for each state in its own language and is usually arranged in parallel columns. Two states having a common tongue naturally employ that language. With regard to the form it may be said that no fixed rule prevails except that the stipulations of the treaty are usually preceded by a recital of the names and titles of the negotiators, with a statement of the purposes which the treaty is intended to accomplish. The treaty is divided into articles and clauses, ending with the terms of ratification and the signatures of the negotiators. A copy is prepared for each contracting party, and the signatures follow, usually according to the principle of the *alternat*, i.e., the plenipotentiary from each state signs first the copy intended for the use of his own government. After the act of ratification by each of the parties there follows the formal exchange of ratifications, when the operation of the treaty begins. Treaties sometimes contain provisions for the accession of third parties. Such were the Declaration of Paris (q.v.) in 1856, the Geneva Convention (q.v.) of 1868, and the Treaty of Washington of 1871. See Washington, Treaty of.

Treaties are terminated in various ways. They cease to be binding with the mutual consent of the parties thereto; or with the denunciation of either party if that right has been reserved when the object of the treaty has been attained, as in the case of a boundary treaty, an arbitration treaty, or convention for the settlement of claims; when the operation of the treaty is conditioned upon terms which no longer exist, as in the case of a treaty allowing free navigation on a river which has ceased to be navigable; and when either party refuses to perform mutual stipulations. In the latter case the other party may consider itself released from its obligations, or it may demand a fulfillment of the treaty and require an indemnity for injuries resulting from any infractions thereof. By the usages of international law the refusal of either party to abide by a treaty, however burdensome, is a sufficient cause of war, since, as in the case of an ordinary contract, it is binding upon both parties until mutually abrogated. Thus, the German invasion of Belgium in 1914, in defiance of the treaty of neutralization to which Great Britain was a party, afforded cause of war to the latter state. Material change in the circumstances contemplated in a treaty is sometimes put forward as sufficient ground for disregarding it. Thus, in 1915 Greece refused to live up to the terms of her treaty with Servia, whereby she was bound to come to Servia's aid if attacked by Bulgaria, on the ground that the treaty contemplated independent aggression on Bulgaria's part, and not aggression incidental to the action of powers of the first rank. Finally, it is to be said that a treaty is terminated when the state of things contemplated by the parties, and hence its real basis, no longer exists. Thus, a treaty is entered into in contemplation of the continuance of a particular form of government which in the course of time is displaced by another. Or the basis of the treaty may be changed by the absorption of one state by another, as in the case of Algeria, a state with which the United States had a treaty previous to the French conquest begun in 1830. Similarly the establishment of the German Empire in 1871 put an end to the treaties between the United States and the several German states with which she had entered into treaty relations. When a state is destroyed or loses its national character by other means, its treaties fall to the ground, but ordinarily a mere change in the form of government will not affect its obligations to other states. In case of war between the contracting parties all treaties are suspended, while certain of them are terminated. Treaties stipulating for a permanent arrangement of territorial and other national rights are at most simply suspended during the war and revive at peace. Such are treaties which recognize within certain territorial limits the independence of one of the contracting parties; treaties which establish new rules or modify old rules of international law, such as the Declaration of Paris of 1856; and treaties which contemplate a state of war and which come into effect only at the outbreak of hostilities, such as treaties of alliance and treaties which regulate blockades and define contraband of war, regulate rules of capture, etc. Treaties of commerce and navigation and postal conventions are usually extinguished by war.

Sir Travers Twiss says that Great Britain in practice admits of no exception to the rule that all treaties as such are put an end to by subsequent war between the contending parties. In pursuance of this rule the treaties of Westphalia and Utrecht were several times reversed by the signatory powers after they had engaged in war with one another. (See WESTPHALIA, PEACE OF; UTRECHT, PEACE OF.) A notable diplomatic discussion between Great Britain and the United States arose after the War of 1812 over the question whether the Treaty of 1783 (see PARIS, TREATIES OF), in so far as it granted to the Colonists fishery rights off Newfoundland, was suspended by the subsequent war between the contracting parties. The United States claimed that the treaty provision in question was not extinguished, it being the recognition of a preëxisting right which the Colonies had always enjoyed in common with the mother country. Great Britain claimed, on the other hand, that the permission to fish on British coasts was in the nature of a grant of a special privilege and therefore terminated by the war.

As in the case of private contracts, certain rules for the interpretation of treaties have grown up. Phillimore arranges the rules of interpretation under three heads: (1) authentic interpretation, i.e., the interpretation supplied by the lawgiver himself; (2) usual interpretation, based on usage and precedent; and (3) doctrinal interpretation, or the interpretation founded upon scientific exposition of the terms of the treaty itself. The following are the commonest rules of interpretation: Words are presumed to have been used in their ordinary sense, but technical terms are used in the sense and with the meaning applied to them in the particular art to which they belong; the provision of a treaty can have but one true meaning and the interpretation must be mutual; the interpretation should be made with regard to the context and spirit of the whole treaty; terms peculiar to the language of one of the contracting parties must be given the meaning which they have in that language; clauses defining grants, privileges, and favors should be strictly interpreted; an interpretation which renders a treaty inoperative is to be avoided; special clauses are to be preferred to general, prohibitory to permissive; earlier clauses are explained by later ones and obscure clauses by clearer ones in later treaties, as later treaties explain and modify earlier ones on the same subject. The rule has been laid down by the United States Supreme Court that a treaty is on the same plane of equality with a statute of Congress, so that a later statute may supersede a prior treaty, while a subsequent treaty may supersede a prior statute on a given subject. A notable instance was the supersession in 1882 of a treaty with China by the act of Congress for excluding Chinese laborers. This mode of terminating treaties, however, is not sanctioned by international law and does not affect the responsibility of either contracting party for the fulfillment of its obligations. In the United States treaties go into effect from the date of signature so far as the contracting parties are concerned, but only from the date of ratification so far as the rights of the individual are involved. Another rule of interpretation in the United States is that the Supreme Court will not undertake to enforce a treaty which requires congressional legislation for its execution. Until such legislation is forthcoming the individual concerned must address himself to the political departments of the government.

To secure the enforcement of treaties, it was formerly the custom to demand and receive hostages, the last instance of the kind being in 1748 to secure the execution of the Treaty of Aix-la-Chapelle. Solemn oaths accompanied by religious rites on the occasion of ratification were once common, but are no longer resorted to. Pledges are sometimes required, as in the case of the treaty of peace between Germany and France in 1871, when certain French fortresses were retained by the Germans as security for the payment of the large indemnity exacted from France. The organs for the enforcement of a treaty are the courts, the legislature, the executive, and the army and navy. Thus, treaties of peace, of cession, of commerce, etc., are enforced for the most part by the legislative branch assisted by the executive, while in the case of treaties of naturalization, extradition, and treaties affecting the rights of foreigners the judicial branch plays an important part.

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TREATY ELM. The tree in Shackamaxon, Philadelphia, under which William Penn made his famous treaty with the Indians in 1682. Its probable site is now occupied by the Penn Treaty Monument.

TREATY RIGHTS, ECCLESIASTICAL. Those rights relating to the exercise of religion which are secured by treaty to the subjects or citizens of one state while they are residing in the territory of another state. The international agreements from which such rights arise differ radically from those treaties, generally known as concordats, which are made from time to time between sovereign states and the see of Rome to regulate the condition of the adherents of the Roman Catholic church within the jurisdiction of the contracting state, since no ecclesiastical authority is made a party to the contract, which is directly between sovereign states in favor of the citizens of one or both. Such a body of rights belongs to the department of private international law. It had its origin in the Reformation period, when the organic unity of Western Christendom was broken and there was no single ecclesiastical authority with which a state could deal in relation to all its subjects. At the present time among the Great Powers of the world, and especially among those of Western civilization, the liberties and rights of foreign-born residents are amply secured by what is known as "the most favored nation clause" of the prevailing treaties. Those nations, however, which have been foremost in missionary enterprise among peoples of a different civilization have found their interests to require intervention by their governments, and the United States of America, in the protection of widespread missionary enterprise, has secured for its citizens ecclesiastical rights in many countries. These rights differ considerably both in extent and kind, although, speaking generally, they have been elaborated as time went on and intercourse became more frequent. The first of such rights specifically mentioned was secured by the United States in its Treaty of 1805 with the Sultan of Tripoli, in which it was provided that the Consul or Agent of the United States should have liberty to exercise his religion in his own house, and that his servants should not be impeded in going to his house at the hours of prayer. The Treaty of Guadalupe Hidalgo concluded with the Republic of Mexico in 1848 stipulated for American residents freedom from prosecution on account of their religion and also liberty to propagate it. The Treaty concluded in 1856 with the King of Siam provides that all American citizens visiting or residing in Siam shall be allowed the free exercise of their religion, and liberty to build places of worship in such localities as shall be assented to by the Siamese authorities. Americans have ecclesiastical treaty rights in China which were not abrogated by the foreign intervention following the Boxer uprising. They are provided by two treaties—one of June 18, 1858, and the other of July 4, 1868. American citizens have a right by the terms of these treaties to teach and practice peaceably the principles of the Christian religion, to reside in those places where foreigners are permitted to reside, and in such places to establish and maintain schools and to maintain cemeteries free from profanation. They have also the right to attend the Chinese educational institutions under the control of the central government. By the Treaty of 1858 with Japan Americans are secured the free exercise of their religion and the right to erect suitable places of worship. American citizens are forbidden to injure any Japanese temple or *Mia*, and neither Americans nor Japanese are allowed to do anything calculated to excite religious animosity. The government of Japan has abolished the practice of trampling on religious emblems. By the Treaty of 1859 with the Republic of Paraguay citizens of the United States residing in Paraguay are at liberty to exercise in private and in their own dwellings or the dwellings of the consuls of the United States their religious services, but no right of propaganda is specified. The Treaty of 1830 with the Ottoman Empire merely confirmed as the treaty rights of Americans privileges already existing. American missionaries were first established in Turkey in 1818, and the privileges of extraterritoriality were then assigned to them by ancient usage. The liberty to exercise their religious functions, as a privileged class, had been *ab antiquo* granted by a voluntary extension of what is known as the Edict of Toleration granted by the Turks, upon their conquest of Constantinople, to the ecclesiastics of any friendly Christian nation. While the United States was not a party to the Treaty of Berlin (1878), yet the guaranty given by the Turkish delegates applies to American citizens: "Throughout the [Ottoman] Empire the most different religions are professed by millions of the Sultan's subjects, and not one has been molested in his belief or in the exercise of his mode of worship. The Imperial government is determined to maintain this principle in its full force and to give to it all the extension that it calls for." By a protocol of 1874 a qualified right to hold real estate is granted to American citizens. What is known as the Protestant Charter regulates mission schools.

TREB'BIA (Lat. *Trebia*). A river of north Italy. It rises in the Apennines of Liguria and after a northeasterly course of 58 miles joins the Po above the city of Piacenza. Upon its banks Hannibal defeated the Romans under

Sempronius in 218 B.C. (See Hannibal.) In the vicinity the Austrians and Russians under Suvarov were victorious over the French under Macdonald, June 17–19, 1799.

TREBELLI, trâ-bĕl'lē, Zelia (1838–92). A French dramatic and coloratura soprano, born in Paris. Her real name was Gillebert. At the age of six she began to study the piano and soon was an excellent performer. In 1854–59 she studied singing under Wartel and made her début as Rosina in Rossini's *Barbiere di Siviglia* at Madrid (1859). The following year she sang with success in Germany and in 1862 in London. From then until her retirement in 1889 her career was an uninterrupted series of triumphs in all the European capitals. Twice she visited the United States, in 1878 under Mapleson, and in 1884 during the first season of the Metropolitan Opera House under Abbey. In 1863 she married the tenor Bettini, but after a few years the union was dissolved. Her death occurred at Etretat. She was equally great as a singer and as a versatile actress.

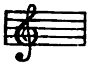
TREBITSCH, trā'bĭch. A town of Moravia, Austria, 40 miles by rail east of Brünn (Map: Austria, D 2). A fine abbey in the transition style of the thirteenth century and the palace of Count Waldstein are worthy of notice. Woolens, shoes, and malt are manufactured, and horses are dealt in. Pop., 1900, 10,597; 1910, 11,665.

TREB'IZOND (Turk. *Tirabzon;* Lat. *Trapezus;* Gk. Τραπεζοῦς, *Trapezous*, probably so called because founded on a table-land, from *τράπεζα*, *trapeza*, table). A city of Asia Minor, capital of the Turkish Vilayet of Trebizond (Map: Turkey in Asia, D 2). It is on the Black Sea coast near its east end, 570 miles east of Constantinople. The city is built on a small table-land between two deep parallel valleys which run out to the coast. The highest portion is crowned by an ancient castle, and the city is still surrounded by Byzantine walls. The streets are narrow, but the city has a wide extent, nearly every house being surrounded by gardens. There are numerous churches and mosques, some of the latter being old Byzantine churches. The bazars are mostly situated outside of the walls in the Christian quarters, the intramural portion being reserved for the Mohammedan population. The industries include wool, silk, and linen weaving, tanning, dyeing, and filigree manufactures. The harbor is an exposed roadstead, but the geographical position of Trebizond has for many centuries made it the chief entrepôt for the transit trade between Persia and Europe. It is the terminus of the main caravan route to Persia via Erzerum. It is also the northern port of a road attaining the Persian Gulf. The transit trade has, however, greatly declined since the opening of the Russian railroad to Batum. Pop. (est.), about 55,000, of whom considerably more than half are Mohammedans, the rest being chiefly Greek and Armenian Christians. Many Lazi dwell also in Trebizond and obtain a living as bakers or gardeners.

Trapezus was founded by Greeks about 700 B.C. as a colony of Sinope. It was a flourishing city when Xenophon and his Ten Thousand reached it after the famous retreat. In 1204, after the occupation of Constantinople by the Crusaders, Prince Alexius of the Comnenian family established the Empire of Trebizond and made the city his capital. This Empire lasted until 1461, when it was overthrown and the city captured by the Turks. Trebizond was bombarded several times by Russian fleets in the Great War and in the early part of 1916 was captured by combined operations of land and naval forces. See War in Europe.

TREBIZOND, George of. See George of Trebizond.

TREBLE, trĕb''l (OF. *treble*, triple, from Lat. *triplus*, threefold, from *tres*, three + *-plus*, -fold). The highest part in harmonized music, which in general contains the melody and is sung by a soprano voice. The treble or G clef is placed on the second line of the staff, indicating that the note G occupies the line encircled by its lower curve. It is one of the two clefs in use in music for keyed instruments. For the history of the sign, see Musical Notation, *Clefs*.



TREBLE, Lillian Massey (1854–1909). A Canadian philanthropist, the daughter of Hart Almerni Massey (q.v.). She was born at Newcastle, Ontario, and was educated there and at Toronto. In 1897 she married John Mill Treble. While engaged in deaconess and mission work in Toronto she organized classes in domestic science, and her increasing interest therein led to the adoption of a complete curriculum in household science in Toronto University, Manitoba University, and in several women's colleges. She gave to Toronto University a handsome and commodious structure called the Lillian Massey Household Science and Art Building, and this was opened in 1913. She died in California. In addition to numerous benefactions in her lifetime she bequeathed the greater part of a large fortune to charitable institutions.

TRED'EGAR. A market town on the northwest border of Monmouthshire, England, 18 miles northwest of Newport (Map: England, C 5). Coal mining is the chief industry. The formerly important iron and steel works have been abandoned. The town owns gas and water works and cemeteries. Pop., 1901, 18,574; 1911, 23,601.

TREE. A plant which attains a considerable height and has a relatively large development of woody tissue. Trees differ from herbs in size and development of woody tissue. They differ from shrubs in having a single stem, or trunk, which branches out at some distance from the ground, while shrubs often have several stems and are of lower growth and bushy habit. Trees are commonly classed as deciduous or evergreen, depending on the relative permanence of their foliage. (See Duration; Forest.) They also differ among themselves in the manner of their growth, method of branching, etc. See Stem. For descriptions, see Ash; Maple; Oak; Pine; etc.

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Shrubs (New York, 1914); R. V. Cole, *Artistic Anatomy of Trees* (Philadelphia, 1914); J. E. Rogers, *The Tree Book* (Garden City, N. Y., 1914); B. E. Fernow, *Trees and their Care* (New York, 1915); G. E. Massee, *Diseases of Cultivated Plants and Trees* (2d ed., ib., 1916).

TREE, Sir Herbert Beerbohm (1853-). An English actor manager, born in London. He made his debut in 1877 as Grimaldi at the Globe. In 1884 he won great success in *The Private Secretary* at the Prince's, and three years later he undertook the management of the Comedy Theatre and produced *The Red Lamp.* From 1887 to 1896 he was manager of the Haymarket, where one of his productions was *Trilby.* Tree opened the new Her Majesty's (later His Majesty's) Theatre with *The Seats of the Mighty* (1897), afterward producing, among other plays: Grundy's *The Musketeers,* Phillips's *Herod* and *Ulysses,* Fitch's *The Last of the Dandies,* Belasco's *The Darling of the Gods, Oliver Twist,* and *The Beloved Vagabond.*

But he became best known for his elaborate productions of Shakespearean plays. In most of these he himself took leading parts. In 1905 he inaugurated a Shakespeare Festival, which was repeatedly successful. With his company Beerbohm Tree visited Germany in 1907, at the invitation of Emperor William, and in 1916 played in the United States, presenting *Henry VIII* and *The Merchant of Venice.* He was knighted in 1909. His *Thoughts and Afterthoughts* appeared in 1913.

TREE BOA. Any of various long, slender, active South American snakes of the boa family, which spend their lives in trees and have acquired a remarkable power of clinging to the moving branches, even in a high wind, without coiling their bodies about any support. The name is also specifically given to the large ringed boa (*Epicrates cenchris*). See Boa.

TREE CAT. See Palm Civet.

TREE CREEPERS, or Wood Hewers. A group of birds, forming the family Dendrocolaptidæ, related to the ant thrushes (Formicariidæ) and true ovenbirds (Furnariidæ), with the tail feathers stiff and sharp-pointed as in the woodpeckers and similarly useful in climbing tree trunks. The bill is usually curved and slender and often is elongated, enabling them to pull insects out of deep crevices. About 400 forms are known, all confined to tropical America; all have a similar style of coloration, some shade of brown, with white spots beneath and rufous on the wings. See Creeper.

TREE CRICKET. Any one of a group of small, pale-colored crickets which usually inhabit trees and shrubs. They are nocturnal in their habits and lay their eggs in the twigs of various plants—a habit which, when the insects are numerous, results in damage to vineyards and to raspberry and blackberry plantations. The common snowy tree cricket (*Œcanthus niveus*) is a delicate whitish-green insect. The young hatch about the first of May and feed upon plant lice and the eggs of other insects. When full-grown they feed upon vegetation.

TREE DUCK. See Goose, *Wild Geese.*

TREE FISH. One of the Californian rock fishes (*Sebastodes sirriceps*), about a foot long. It is dark olive, blackish above and yellowish below, with the front of the head coppery red, two black bands downward and backward from the eye, and several oblique black crossbands on the sides. Black prominent ridges cross the cranium. See Rockfish, and Plate of Rockfish, etc.

TREE FROG, or Tree Toad. A frog of the family Hylidæ, connecting the toads with the typical frogs and of prevailingly arboreal habits. Tree frogs have teeth on the upper jaw and vomers and in some genera elsewhere in the mouth. The toes are invariably claw-shaped and swollen at the base, and each carries at the tip a flattened, adhesive cushion, whose sticky secretion greatly aids the animal in clinging to smooth surfaces. Most of them are of small size, more elegant in form than the true frogs, of brighter colors and more active habits. They feed on insects, which they pursue on the branches and among the leaves of trees or shrubs. All have loud, piping notes and are remarkable for their power of changing their colors to simulate the tint of the resting place. (See Metachrosis.) They are also remarkable for the great variety in their methods of placing their spawn, and the character of their metamorphoses, which are severally described under Cricket Frog, Ferreiro, Marsupial Frog, etc. The principal genus is *Hyla,* which contains about 200 species scattered all over the warmer forested parts of the world, but especially numerous in tropical America. The type is *Hyla arborea,* common throughout all central and southern Europe and Asia. Of the North American species the most familiar is *Hyla versicolor,* which is a green, gray, or brown warty frog, whose clear, loudly trilled rattle is an almost daily evening sound. One of the first notes heard in the spring in the eastern United States is the piping of *Hyla pickeringii,* a smaller, more yellowish species, often called the peeper. The cricket frog (q.v.) is another numerous species. Various others inhabit the Southern States. Many species of the West Indies and South America carry their eggs about on the back of the females, glued to or sunken into the skin, as is notably the case with *Hyla goeldii.* Notable cases are described in the *Proceedings of the Zoölogical Society of London* for 1895. Australia possesses several species of great interest, especially the familiar *Hyla cœrulea,* whose cry is a sharp crackling bark. The whole group is one of extraordinary variety and interest. Consult authorities cited under Frog. See Colored Plate accompanying Toad.

TREE HOPPER. Any insect of the homopterous family Membracidæ, a very strange group comprising a variety of grotesque forms. The antennæ are inserted in front of and between the eyes, and the prothorax is so prolonged that it covers the rest of the body, and its curious modifications have been developed in order to bring about a protective resemblance of these insects to various plant structures. The tree hoppers, like other Homoptera, have an incomplete metamorphosis, and the young are active and suck the juices of plants by means of their beaks. The species are very numerous, and the group is one of wide distribution. The most bizarre forms occur in tropical regions, but many curious species are found in the temperate zone. A common form in the United States is the little humpbacked *Telemona monticola,* which sometimes swarms on the branches of the Virginia creeper in June. Another interesting form (*Entillia sinuata*) is found upon the leaves of the sunflower and other annual plants. It lays its eggs in the midrib of the upper leaves; the mother insect broods over her eggs, and the young from the time of hatching until full-grown are constantly attended by ants, which are attracted by a sweet secretion. The buffalo tree hopper (*Ceresa bubalus*), so called from its horned prothorax, is a species of considerable economic importance, which damages the small twigs of fruit trees in the act of laying its eggs. Large holes are made in the bark, in which the eggs are inserted in clusters. Consult J. H. Comstock, ***Manual for the Study of Insects*** (8th ed., Ithaca, 1909), and L. O. Howard, ***The Insect Book*** (new ed., New York, 1914).

TREE KANGAROO. One of a genus of kangaroos which in the forests of northern Australia and New Guinea inhabit trees, although they creep awkwardly about the branches, as if not yet well adapted to an arboreal life. They constitute the genus *Dendrolagus* and embrace several species, of which the black one (*Dendrolagus ursinus*) of New Guinea, which is very dark in color except the whitish face, and about 20 inches long exclusive of the tail, is one of the best known. The relative length of the limbs is of normal proportions, unlike that of ordinary kangaroos. See Plate of KANGAROOS.

TREE LIZARD. See DRAGON.

TREE OF HEAVEN. See AILANTHUS.

TREE PARTRIDGE. See HILL PARTRIDGE.

TREE PORCUPINE. One of the small, prehensile-tailed arboreal porcupines of South America of the genus *Sphingurus*. There are eight or nine species, the most common of which is the Brazilian tree porcupine (*Sphingurus prehensilis*). See PORCUPINE, and Plate of PORCUPINES AND HEDGEHOGS.

TREE SHREW, or SQUIRREL SHREW. One of the curious insectivorous animals of the family Tupaiidæ, of the Oriental region and eastward to Borneo. They are related to the hedgehogs, but outwardly have almost exactly the appearance of ordinary squirrels, except for the long, flexible, shrewlike nose. Some 48 forms have been named, of which the Malayan banxring (*Tupaia glis*), with its several subspecies, is one of the best known and often becomes a pet or resides, half tame, in gardens and village shade trees. The Madras tree shrew (*Tupaia*, or *Anathana*, *ellioti*) is found throughout India. All are much alike, feeding on both insects and fruits. For the most complete summary, consult M. W. Lyon, "Treeshrews: An Account of the Mammalian family Tupaiidæ," in ***United States National Museum, Proceedings***, vol. xlv (Washington, 1913).

TREE SNAKE. Many snakes are more or less arboreal in habits, but some are so distinctively so as to merit the name especially. Many of the smaller boas (see TREE BOA) live almost wholly in tree tops, as is necessary in the flooded parts of the Amazonian region. Among the colubrine groups of that region is the genus *Leptophis*, whose species are very slender with long whiplike tails. The best known (*Leptophis liocercus*) is a beautiful creature 6 feet long, the upper surface golden green, the lower yellow or white; it subsists upon small reptiles and birds and their eggs. An Oriental genus (*Dendrophis*) has the ventral scales keeled and notched, enabling them to take hold of a surface so securely that they are able to glide up the branches of trees in almost straight lines. A group of tropical green tree snakes (Dipsadomorphæ) exists the species of which are highly poisonous, and in Africa are found tree vipers (q.v.). See OPISTHOGLYPHA.

TREE TOAD. See TREE FROG.

TREE TOMATO (*Cyphomandra betacea*). A semiwoody South American plant belonging to the family Solanaceæ, often cultivated for its fruit. The plants are evergreen, 6 to 10 feet in height, and they bear on long pedicels numerous egg-shaped fruits about 2 inches in diameter. In color the smooth-skinned fruits are greenish purple, changing as they ripen to reddish or yellowish brown. In flavor and uses the fruit is similar to the ordinary garden tomato. Plants begin to bear when about two years old from seed and remain continuously in fruit for several years. The tree tomato is not hardy and can be grown in the North only under glass.

TREE VIPER. A genus (*Atheris*) of rather small, arboreal vipers of Africa. They are of bright green and yellow colors, so as to be readily concealed in foliage. Their tails are especially prehensile, like those of boas. Four species are known.

TREE WORSHIP. See NATURE WORSHIP.

TREFFEL, trĕ′fĕl′, GEORGES (1873–1914). A Frenchman of letters and encyclopædist, born at Vayrac. He studied at the lycées of Auch, Toulouse, and Henry IV and became associated with the editorial department of the *Nouveau Larousse*. He contributed also to the *Petit Larousse*, the *Larousse pour tous*, and the *Larousse Mensuel*. In addition to writing numerous and excellent biographies for these works, he compiled the ***Atlas départemental Larousse***.

TREFFENFELD, JOACHIM HENNIGES VON. See HENNIGES VON TREFFENFELD, JOACHIM.

TRE'FOIL. A frequent charge in heraldry (q.v.), representing the clover leaf, which is always depicted as slipped, i.e., furnished with a stalk.

TREFOIL (OF. *trifoil*, *trefeul*, Fr. *trèfle*, from Lat. *trifolium*, trefoil, three-leaved, from *tres*, three + *folium*, leaf), BIRD'S-FOOT TREFOIL (*Lotus*). A genus of plants of the family Leguminosæ. The pods are cylindrical, somewhat spongy within and imperfectly divided into many cells. The name "bird's-foot trefoil" is derived from the resemblance of the clusters of pods to a bird's foot. The numerous species are natives of the temperate and colder regions of the Old World. The common bird's-foot trefoil (*Lotus corniculatus*) is common in European pastures. The spreading decumbent stems, 4 to 16 inches

BIRD'S-FOOT TREFOIL (*Lotus corniculatus*).

long, arise from a short thick rhizome and bear umbel-like cymes of 5 to 10 yellow flowers, which have a rich honey-like odor. The leaves have three obovate leaflets, and at the base of each leafstalk there are two large leaflike ovate stipules. The plant is by some regarded as the shamrock (q.v.) of Ireland. It is nutritious and much liked while young by all kinds of stock. It is common in the United States, especially in the South. A larger species, similar, with stem nearly erect, more compact heads of smaller flowers, and smaller seeds, is the greater or narrow-leaved bird's-foot trefoil (*Lotus major*) of much the same range. Marsh bird's-foot trefoil (*Lotus uliginosus*) is common in damp meadows. The winged pea (*Lotus tetragonolobus*), remarkable for four membranous wings which run along its pods, is a native of southern Europe, where it is grown for salads and as an ornamental plant. It is cultivated in the United States mainly as a forage plant and a winter crop for plowing under in spring as green manure. The name "tick trefoil" is given to various species of Desmodium, and shrubby trefoil is *Ptelea trifoliata.* See CLOVER.

TRE FONTANE, trâ fôn-tä'nâ (It., Three Fountains). The traditional scene of St. Paul's martyrdom, a spot outside of Rome, 3 miles from the Porta San Paolo. According to the legend, when the Apostle's head was struck off, it made three bounds, and at each spot a spring gushed forth. Over the springs stands the church of St. Paul without the Walls, which contains the column to which St. Paul was bound.

TREGELLES, trē-gĕl'ĭs, SAMUEL PRIDEAUX (1813–75). An English scholar and New Testament critic, born at Falmouth, of Quaker parentage. He attended the Falmouth Classical School for four years (1825–28), but was in the main self-educated. Tregelles' interest in biblical studies began early, and from 1838 to his death he devoted himself assiduously to the study of the New Testament text and related subjects. In 1844 he published *The Book of Revelation in Greek, Edited from Ancient Authorities with a New England Version.* In 1854 his valuable *An Account of the Printed Text of the Greek New Testament* appeared. This work was not only a history, but a discussion of principles of textual criticism, and as such is still of value. His next important work was his revision of the New Testament part of Horne's *Introduction* under the title, *An Introduction to the Textual Criticism of the New Testament* (1856). Meanwhile he was diligently collecting material for a new critical edition of the Greek Testament, collating manuscripts, examining patristic readings and important ancient versions. The first part of Tregelles's *Greek New Testament, Edited from Ancient Authorities*, appeared in 1857. The last installment was published in 1872, sent out while the author was suffering from illness which proved fatal not long after. Among other writings not directly connected with the New Testament text his facsimile edition of the *Canon Muratorianus* (1860) and his translation of Gesenius' Hebrew Lexicon (1847) deserve mention. Tregelles' piety was sincere, his scholarship exact and painstaking, and his industry remarkable. His edition of the Greek Testament ranks with those of Tischendorf and of Westcott and Hort, as one of the three great critical editions of the last century. His principles, clearly worked out and consistently applied, were similar to those of Lachmann, but his reconstructed text was based on a wider and more thorough survey of the field of evidence than Lachmann's. An *Appendix* to Tregelles' Greek Testament, edited by Hort and Streane, from Tregelles' own papers was published in 1879. Consult Scrivener, *A Plain Introduction to the Textual Criticism of the New Testament*, vol. ii (4th ed., London, 1894), and Hauck-Herzog, *Realencyklopädie für protestantische Theologie*, vol. xx (Leipzig, 1908).

TRE'HALASE. See ENZYME.

TREITSCHKE, trītsh'ke, HEINRICH VON (1834–96). A German historian and political writer. He was born at Dresden, Sept. 15, 1834, the son of an officer in the Saxon army. His father's family was of Bohemian descent (the family name was originally Treschky) and had emigrated at the beginning of the Thirty Years' War from Bohemia to Saxony. An illness in early life impaired his hearing and resulted some years later in complete deafness, and young Treitschke had to give up his ambitions of a more active life for one of study. The failure of the German revolution in 1848 made a deep impression on him, and while still a boy he advocated, to the disgust of his highly conservative family, a unification of Germany under Prussian leadership. He studied history, economics, and politics at Bonn and Leipzig. After first considering a journalistic career Treitschke in 1858 became a lecturer in history at the University of Leipzig. Popular as a teacher from the beginning, he lectured before large audiences on the constitutional history of Germany. Political events he followed always with close interest. In 1864 he published an essay "Bundesstaat und Einheitsstaat," one of his most important writings and by many considered his best work, in which he attacked the German confederacy and advocated a German union. In 1866, when Baden joined with Austria in the Seven Weeks' War, he resigned the chair he then held at Freiburg and became editor of the *Preussische Jahrbücher* in Berlin. But in the same year he was called to the University of Kiel, in 1867–73 he was a professor at Heidelberg, and in 1873 he accepted a chair at Berlin. After the foundation of the German Empire he was elected to the Reichstag. At first a member of the National Liberal party, later he became a conservative. He attracted attention as a parliamentary orator and was noted for his speeches against the Ultramontanes (q.v.) and the Socialists. His strong stand against modern conceptions of social problems and their solution led him into various literary feuds with leading German economists like Brentano and Schmoller and caused his resignation as an editor of the *Preussische Jahrbücher.* As professor of history at the University of Berlin he attracted large and notable audiences because of his great powers as a speaker and especially because of his uncompromising Germanism. He bitterly denounced Catholics, Jews, and Socialists, in fact any one who in his opinion was not truly Prussian and German. He died at Berlin, April 28, 1896.

When a young man Treitschke had planned a history of modern Germany, but the first volume did not appear till 1876, and the work was left unfinished, covering only the period down to the events of 1848. With the possible exception of Mommsen's *Roman History*, the most brilliant work of the kind in the German language is Treitschke's *Deutsche Geschichte im neunzehn-*

ten Jahrhundert (5 vols., 1874–94; Eng. trans., *History of Germany in the Nineteenth Century*, 7 vols., New York, 1915 et seq.). Every side of national life and thought is treated with a knowledge, a vigor, and an eloquence that have made the book a national possession. But its faults are as conspicuous as its merits. It is written throughout from a Prussian standpoint, with a pronounced antipathy to the smaller states and without comprehension of the men and movements that opposed the military and bureaucratic régime of the Hohenzollerns. Treitschke was the last and greatest of the Prussian school which arose in the years of national depression and contributed powerfully to prepare the soil for the idea of a national union of Germany under Prussian leadership.

After the outbreak of the European War in 1914 the discussion of Treitschke's position and influence in the development of modern political thought in Germany was revived, and he was even attacked as one of the spiritual instigators of the great war. Especially in England, where he was almost unknown during his lifetime, many of his writings were now read with interest, and his anti-English utterances were held partially responsible for the growing antagonism between the countries in recent years. Originally, however, Treitschke was an admirer of England and English institutions, although his later judgment became more severe because of England's unfriendly attitude in the Franco-Prussian War. When Germany entered upon the project of a colonial empire, Treitschke prophesied an unavoidable clash of interests with England, and without predicting a war he considered the possibility of it.

Besides his greatest work, Treitschke's writings include: *Zehn Jahre deutscher Kämpfe, Schriften zur Tagespolitik* (1874; 3d ed., supplemented, 1897); *Der Sozialismus und seine Gönner* (1875); *Der Sozialismus und der Meuchelmord* (1878); *Ein Wort über unser Judentum* (1880); *Historische und politische Aufsätze* (1865; N. S., 1870; vol. iv, 1897); *Zwei Kaiser* (1888); and the posthumous volumes *Reden im deutschen Reichstag* (1896) and *Politik*, lectures (2 vols., 1897–98). Selected writings, *Ausgewählte Schriften*, appeared in 1907 (2 vols.). In early life he published two volumes of verse, *Vaterländische Gedichte* (1856) and *Studien* (1857). His letters to R. von Mohl and to his wife and his correspondence with Gustav Freytag are to be had in German. Selections from Treitschke's *Lectures on Politics* were translated by A. L. Gowne (London, 1914), and in 1915 a collection in English was made of essays written between 1871 and 1895, under the title *Germany, France, Russia, and Islam.*

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TRELAWNY, tre-lạ'nĭ, EDWARD JOHN (1792–1881). An English author, known as the friend of Shelley and Byron (qq.v.). He was born in London. Though he was of an ancient and famous family, his education was neglected. Entering the royal navy at the age of 13, he served in the fleet blockading Cadiz (1805). He subsequently deserted and passed through exciting adventures in the East Indies. In January, 1822, he met Shelley and Byron at Pisa. He was the last to see Shelley's boat disappear in the fog on the memorable 8th of July, 1822; he superintended the cremation of Shelley's body at Viareggio, snatching the heart from the flames. In 1823 he accompanied Byron to Greece, where he took part in the war of liberation and married, as his second wife, the sister of the Greek chieftain Odysseus. After living in Italy and traveling in the United States (1833–35), he settled in England, becoming a lion of London society. He died at Sompting in Sussex. His body was cremated and buried by the side of Shelley's in the Protestant cemetery at Rome. Trelawny charmed two generations by his rich fund of anecdote. He was sought out by young men who wished to meet the comrade of Byron and Shelly. He figures as the old seaman in Millais's "Northwest Passage." Trelawny wrote his early autobiography under the title *The Adventures of a Younger Son* (anonymous, 1831). How much is truth and how much fiction in this book will probably never be determined. Trelawny is best known for *The Recollections of the Last Days of Shelley and Byron* (1858), republished, with changes, as *Records of Shelley, Byron, and the Author* (1878). Both are brilliant books, the latter of great value. Consult the edition of *The Adventures of a Younger Son*, with memoir by E. Garnett (London, 1890), and *Letters* (ed. by H. B. Forman, Oxford, 1910).

TRELAWNY, SIR JONATHAN (1650–1721). An English bishop and third Baronet of Trelawny. He was born at Pelynt, Cornwall, graduated at Christ Church, Oxford, in 1672, and took priest's orders in 1676. He took an active part in suppressing Monmouth's Rebellion of 1685 and was rewarded with the bishopric of Bristol. The appearance of the First Declaration of Indulgence (see DECLARATION OF INDULGENCE) alienated him from King James; he refused to sign the declaration, and later successfully opposed the effort of the Earl of Bath to control the Cornish elections in the interests of the crown. On May 18, 1683, he united with five other bishops and the Archbishop of Canterbury in drawing up a petition against the Second Declaration of Indulgence. As a result all seven were in the following month committed to the Tower on a charge of seditious libel, but were acquitted, and soon afterward King James II was driven from the throne. Trelawny seems not to have united in the invitation of William, but after the coronation of the new sovereigns he was made Bishop of Exeter. Consult Elizabeth Strickland, *Lives of the Seven Bishops Committed to the Tower in 1688* (London, 1866).

TRELEASE, tre-lēs', WILLIAM (1857–). An American botanist, born at Mount Vernon, N. Y. He graduated at Cornell in 1880, and, after serving as instructor in botany at Harvard and at the University of Wisconsin, was professor at Wisconsin in 1883–85. In 1885 he was made Engelmann professor of botany in Washington University at St. Louis, and in 1889 became, in addition, director of the famous Missouri Botanical Garden there. In 1913 he was appointed professor of botany at the University of Illinois. He was the first president of the Botanical Society of America (1884–85), served also as president of the American Society of Naturalists in 1903, and was elected to the National Academy of Sciences in 1902. His chief interest was the classification of certain groups of flowering plants, especially the genus *Agave* (q.v.).

TREMAREC, Yves Joseph de Kerguelen-. See Kerguelen-Tremarec, Y. J. de.

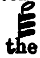
TREM'ATO'DA (Neo-Lat. nom. pl., from Gk. *τρηματώδης*, *trēmatōdēs*, having many holes, porous, from *τρῆμα*, *trēma*, hole). A class of Platyhelminthes, the flukes, characterized by the possession of certain suctorial pores or openings. They have soft roundish or flat bodies, and their visceral organs are lodged in the parenchyma of the body. Most of them are hermaphrodites. They seldom reach a large size (at best about 5 inches), but are usually visible to the naked eye. The color is dull gray, green, or brown, sometimes mottled. The reproductive organs are complicated and developed to a remarkable degree, occupying a large part of the body. These worms are not all parasitic, nor are the parasitic forms confined to a single host during the whole of their existence. Many of them have a remarkable life history, showing an extraordinary succession of generations, in which the young resemble not parents or grandparents, but great-great-grandparents. The first three or four generations live in the body of some invertebrate, especially water snails; but the next generation is free-swimming, and its offspring are like the original form and parasitic within some vetebrate.

The Trematoda are divided into two orders: (1) *Ectoparasitica*, trematodes with three or more suckers, living on the outside of their hosts and with a direct development from the egg; (2) *Endoparasitica*, trematodes with not more than two suckers, living in the blood vessels, alimentary canal, or other spaces of higher animals and undergoing a complicated alternation of generations. This order includes a large number of species, many of which are dangerous to domestic animals and also to man. See Fluke.

TREMBLAY, trän'blā', François Leclerc du. See Joseph, Father.

TREMBLEY, trän'blā', Abraham (1700–84). A Swiss naturalist, principally known for his studies in Holland of the hydra, and the discovery of its power of regenerating lost parts. (See Regeneration.) His *Mémoires pour servir à l'histoire d'un genre de polypes d'eau douce à bras en forme de cornes* (2 vols., 1744) brought him great fame and became a classic.

TREM'OLITE (from *Tremolo*, an Alpine village, where the mineral was discovered). A variety of amphibole (q.v.), consisting of calcium and magnesium silicate. It is white to dark gray in color. It occurs usually in monoclinic prisms, although sometimes it is found in fibrous aggregates with a silky lustre.

TREM'OLO (It., trembling). In music, an expression indicating that a note or a chord is to be reiterated with great rapidity for an indefinite number of times, so as to produce a quavering sort of effect. In singing the tremolo is highly effective in dramatic situations. But with many singers it is a mannerism arising from improper control of the breath. (See Singing.) For the stringed instruments the tremolo is extensively employed by composers and is written  It is produced by a very rapid alternation of the up-and-down stroke of the bow.

TRÉMOUILLE. See La Trémoille.

TREM'ULANT. See Organ.

TREMULOUS POPLAR. See Aspen.

TRENCH, Herbert (1865–). A British poet, born at Avoncore, County Cork, Ireland, and educated at Oxford, where he took honors, and became a fellow of All Souls. For a time he was senior examiner at the Board of Education; he traveled in many lands and served also as director of the Haymarket Theatre. His books include: *Deirdre Wedded* (1901), containing 19 poems in addition to that which gives the volume its title; *The Questioners* (1907); *Lyrics and Narrative Poems* (1911); *Ode from Italy in Time of War* (1915).

TRENCH, Military (from OF. *trencher*, *trancher*, Fr. *trancher*, to cut, from Lat. *truncare*, to lop, from *truncus*, trunk, from *truncus*, OLat. *troncus*, maimed). An excavation of varying dimensions, the earth from which is placed directly in front to form a parapet. Trenches are to be found in permanent and semipermanent fortifications as well as hasty intrenchments (see Fortification), their nature, number, and methods of construction varying with the circumstances. Trenches are necessary for both the attack and the defense, modern conditions and future indications giving a constantly increasing importance to their use by an attacking force. Time is often a great factor in the determination of the style of trench to be adopted, or the number of men required for its construction. Usually an average of one pace per rifle is reckoned for shelter trenches, which for troops kneeling would require a depth of about 3 feet, while as a shelter for men standing it would be necessary to excavate to 4 feet, 7 inches, the removed earth in both cases being sufficient to provide an upper parapet of about 3 feet in thickness.

Trenches have been long advocated by military engineers and have been gaining greatly in favor in general military opinion in late years. The tendency for a long time to have all such work done by the engineers is being superseded by an attempt to establish simple standard types which shall be generally understood by all troops so that it shall only be necessary in campaign operations to indicate to troops that a lying-down, or a kneeling, or a standing trench is to be constructed in a given general position, and the troops which are to defend the trenches will themselves construct them, under only the general supervision of the engineers. In the case of occupation of the same lines and works for a long time the works are more closely supervised by the engineers to secure the best construction and to avoid needless changes as the commands occupying the lines are changed. Modern warfare is carried on by enormous armies which occupy long fronts whose ends rest in the sea or on forbidding mountains. The opposing lines therefore parallel each other for miles during long periods of time. Increasing attention is consequently focused on the trenches. The tendency has been to make the front line deep enough for standing and only wide enough for the passage of a single file behind the line of soldiers defending the trench. A bench or berm is left at the top and front of the trench on which the soldier may rest his elbows in taking his aim.

If trenches are made deeper than as just indicated, a banquette or bench of suitable height is left against the front face for the soldiers to stand upon. To prevent them from caving in, the nearly vertical faces of the trench are ordinarily revetted with planks, woven brush, or bags filled with earth. The horizontal plan or line of trenches is given small changes of direction and provided with traverses to localize the effects of bursting shells and of enfilade or flanking fire. The front or parapet is provided with head cover of logs, sandbags, or earth supported on wooden roofs. Frequent loopholes for firing are left in this head cover.

In front of the trenches the ground is cleared to afford a better view of the enemy and to deny him cover. Obstructive barriers or obstacles largely of barbed wire are placed to impede his progress in the event of a charge. Running forward from the front line of trenches are galleries constructed as bases for mining operations against the enemy. Running back from the front line of trenches are communicating trenches. These may be dug lower and covered over for protection from fire and overhead view. These lead to lines of trenches in the rear and to the positions of the supports and reserves. Published statements from the European War indicated that an increasing use was being made of subterranean passages and rooms where many troops might rest during bombardment and emerge to resist the subsequent charge. Frequent variations of these details of construction occur. In crossing low and swampy ground it is impracticable to excavate and all protection must be afforded by higher parapets. These in turn have the objection of being visible; but a choice must often be made between two defects and the less objectionable accepted. Great care must always be exercised to provide proper drainage for all trenches, as their value will otherwise be decreased if not entirely sacrificed. See MINES AND MINING, MILITARY; SIEGE.

TRENCH, RICHARD CHENEVIX (1807-86). Archbishop of Dublin, poet, and scholar. He was born in Dublin and educated at Harrow and Trinity College, Cambridge, where he took his degree in 1829 and was intimate with the members of the Apostles' Club, including Tennyson, Hallam, and Sterling. He was ordained deacon in 1832 and became curate to Hugh James Rose (q.v.) at Hadleigh, identifying himself to a certain extent with the High Church party. He was curate of Curdridge in Hampshire from 1835 to 1841 and in 1845 was examining chaplain to Bishop Wilberforce. From 1846 to 1858 he held a theological professorship at King's College, London, having meantime been appointed in 1856 to the deanery of Westminster. In 1863 he became Archbishop of Dublin and took a foremost position in the opposition to the disestablishment of the Episcopal church in Ireland, as well as in the settlement of the delicate questions which arose after it had been accomplished. He resigned his see, owing to infirmity, in 1884 and died in London two years later. Noteworthy among his theological works are: *Notes on the Parables* (1841); *Notes on the Miracles* (1846); *Commentary on the Epistles to the Seven Churches* (1861); *Studies in the Gospels* (1867), all of which were widely popular and influential. His poetical work is graceful, tender, and thoughtful as a whole. A collected edition appeared in two volumes (1885). His best-known books in philology are *The Study of Words* (1851); *English, Past and Present* (1855); *Proverbs and their Lessons* (1905). To these may be added his *Lectures on Mediæval Church History* (1877). Consult Trench, *Letters and Memorials of Archbishop Trench* (London, 1888), and J. Sylvester, *Archbishop Trench* (ib., 1891).

TRENCH'ARD, STEPHEN DECATUR (1818-83). An American naval officer, born in Brooklyn, N. Y. He became a midshipman at the age of 16, was promoted to passed midshipman in July, 1840, was wrecked in the *Washington* off the coast of North Carolina in 1845, was attached to the *Saratoga* during the Mexican War, became a lieutenant in 1847, and was slightly wounded while serving under Tatnall when that officer assisted the English in their attack on the Pei-ho forts in China. During the Civil War he served on the *Rhode Island*, was made commander in July, 1862, and participated in the bombardments of Fort Fisher in 1864 and 1865. He was promoted to be captain in 1866, commodore in 1871, and rear admiral in 1875, commanded the North Atlantic squadron in 1876-78, and retired in 1880.

TRENCK, FRANZ VON DER, BARON (1711-49). An Austrian soldier of fortune, born at Reggio in Calabria, the son of a lieutenant colonel in the Austrian service. He became a cavalry officer at 17, distinguished himself by his mental accomplishments, his remarkable success in the fields of gallantry, and his love for dueling and miscellaneous murder, which in the end forced him to leave the army. He went to Russia, where he was made a captain of hussars, but was cashiered not long afterward for gross insubordination and imprisoned at Kiev, whence he returned to settle on his estates in Slavonia. Trenck armed and drilled 1000 of his tenants, whom he called Pandours, and by their means succeeded in restoring order on the frontier, which was overrun with Turkish banditti. In 1741 he offered the services of his regiment to Maria Theresa, and his aid was accepted. His deeds of violence at last led to his trial before a court-martial and condemnation to imprisonment for life. He was confined at the Spielberg, near Brünn, until his death, caused by poisoning himself when he found escape impossible. Consult Hübner, *Franz von der Trenck* (Stuttgart, 1788), and Trenck's own memoirs, *Merkwürdiges Leben und Thaten des Freiherrn Franz von der Trenck* (Vienna, 1770).

TRENCK, FRIEDRICH VON DER, BARON (1726-94). A German adventurer, born at Königsberg, the son of a Prussian general and cousin of the preceding. At 16 he became a cornet in the guards and in 1744 ordnance officer to Frederick the Great. In 1749 he became captain of cuirassiers in the Austrian service. While in Danzig in 1754 he was arrested by order of Frederick and kept in severe confinement at Magdeburg till 1763. After his release he settled at Aix-la-Chapelle, where he married the burgomaster's daughter, gave himself to literary pursuits, and went into business as a wine merchant. In 1774-77 he traveled in England and France, and, restored to the possession of his Prussian estates after the death of Frederick II, lived at Berlin and Königsberg. In 1791 he went to Paris and became a zealous adherent of the

Mountain party. He was, however, suspected of plotting with the foreign enemy and was guillotined July 25, 1794. Consult the autobiographical *Friedrich Trencks merkwürdige Lebensgeschichte* (Berlin, 1787), which he rendered into French in 1789. His collected writings were published at Leipzig in eight volumes (1786).

TRENDELENBURG, trĕn′de-len-bụrk, FRIEDRICH (1844–). A German surgeon, born in Berlin, the son of Friedrich A. Trendelenburg. He received his medical education in Edinburgh, Glasgow, and Berlin and became professor of surgery at Rostock (1875), at Bonn (1882), and at Leipzig (1895), as successor to Karl Thiersch (q.v.). He is best known for his work in tracheotomy, for his operation to cure varicose veins, and for improvements in pelvic operations.

TRENDELENBURG, trĕn′de-len-bụrk, FRIEDRICH ADOLF (1802–72). A German philosopher, born at Eutin. He was educated at Kiel, Leipzig, and Berlin; was appointed professor extraordinary of philosophy in the University of Berlin, 1833, and full professor in 1837. In this position, which he held until his death, Jan. 24, 1872, he exercised very great influence upon the course of philosophical thought. His criticism of Hegel procured him great renown and was one of the most effective forces that broke the hold of Hegelianism on the German mind. The foundation of his own philosophic doctrine is Aristotelianism, which, however, was modified by Platonic elements. He held and developed the teleological view and maintained that it is confirmed by empirical fact. Mechanical causation he viewed as the servant of teleology, not its enemy. He called his philosophy the "organic view of the world." His most important works are *Elementa Logicæ Aristotelicæ* (1836; 9th ed., 1892; Eng. trans., 1881); *Erläuterungen zu den Elementen der Aristotelischen Logik* (1842; 3d ed., 1876); *Der logische Frage in Hegels System* (1843); *Logische Untersuchungen* (1840; 3d ed., 1870); *Das Naturrecht auf dem Grunde der Ethik* (1860; 2d ed., 1868); *Lücken im Völkerrecht* (1870). His *Historische Beiträge zur Philosophie* (1846–67) and *Kleine Schiften* (1871) are also valuable helps in the study of the history of philosophy. Consult: Bonitz, *Zur Erinnerung an Trendelenburg* (Berlin, 1872); Bratuscheck, *Adolf Trendelenburg* (ib., 1873); Morris, in *The New Englander* (Boston, 1874).

TREN′HOLM, GEORGE A. (1806–76). An American merchant and financier, born at Charleston, S. C. He engaged in business at Charleston and was very successful. During the Civil War he successfully ran the blockade and secured much needed supplies for the Confederacy. From June, 1864, until the end of the war he held the office of Secretary of the Treasury of the Confederate States. After being imprisoned until October, 1865, he was pardoned by President Johnson.

TRENT. A river rising on the northwest border of Staffordshire, England, about 10 miles north of Burslem (Map: England, F 3). It flows first southeast to the border of Derbyshire and afterward, in a generally northeast direction, through the counties of Derby, Nottingham, and Lincoln, then it unites with the Ouse (q.v.) to form the Humber (q.v.). It receives the Derwent, Idle, and Tarn from the west and the Soar from the south; it is navigable for seagoing steamers to Gainsborough and for barges, 120 miles, to Burton-upon-Trent. Length, 170 miles.

TRENT. The outlet of the series of bays between Lake Simcoe and the Bay of Quinté, Lake Ontario (Map: Ontario, H 5), flowing into the latter body at Trenton. It issues from the northeast end of Lake Rice as a wide and picturesque river and is about 40 miles long.

TRENT (It. *Trento*, Ger. *Trient*). A town of Tirol, Austria, 76 miles northwest of Venice, on the left bank of the Adige (Map: Austria, B 3). It is built largely in the Italian style and has some beautiful old palaces. In the Piazza Grande is the celebrated Fountain of Neptune, made of red marble. A beautiful bronze statue of Dante (by Zocchie, 1896) stands in the Piazza di Dante. The Romanesque cathedral, begun in its present form early in the thirteenth century and completed in the fifteenth, constructed entirely of white marble, is the most striking public building. The church of Santa Maria Maggiore is noted as the sitting place of the Council of Trent (q.v.), and a column in the square before it commemorates the event. Among the other interesting architectural features are the castle (the former residence of the prince bishops) and two ancient towers. The municipal building contains a museum of Roman antiquities and other objects. Trent is the chief town of the Italian or Welsch division of Tirol. The chief industries are silk weaving, the making of salami (a kind of sausage), playing cards, pottery, cloth, and wines, and the quarrying of marble and gypsum. The town is the seat of a bishop. Pop., 1900, 24,908; 1910, 30,049. Trent is the ancient Tridentum, which was a Roman colony. It was under the rule of bishops from the eleventh century to 1803, when it passed to Austria.

TRENT, COUNCIL OF. The most notable of the modern ecumenical councils of the Roman Catholic church, held with intermissions from 1545 to 1563. It was the culmination of the Counter-Reformation (q.v.), and its decrees crystallized the results of that movement into the permanent law of the Church. For centuries those who felt the need of reform within the Church had appealed to a general council, and the long-growing discontent with the condition of things after the Great Schism had led to the great councils of the fifteenth century. The Protestant Reformation had taken many of the most ardent advocates of reform out of the Church and left the conservative-minded party in control. A council was at first desired by Luther and his supporters as a means of closing the great breach. At the Diet of Nuremberg in 1523 the German estates appealed to Adrian VI for the summoning of a council "within a year, in concert with the Imperial Majesty and in a German city." Adrian died in the same year, and his successor, Clement VII, while not refusing a council, did nothing towards calling one; and the political breach between Charles V and the holy see made the Emperor's requests unfruitful. Thus it happened that when the design was put into execution in the pontificate of Paul III the Augsburg negotiations (see REFORMATION) had failed, the break in Christendom was an accomplished fact, and the sincere but reactionary party was left in control.

The council was finally assembled at Trent, Dec. 13, 1545. The Emperor desired to have the discussions opened on points of general agreement, in the hope of gaining the confidence of the

Protestants; but the party in control brought to the front the questions most in dispute—the authority of the Scriptures in the Vulgate text, the right of interpretation, ecclesiastical tradition, and the doctrine of justification, as to which the old positions were maintained. Legates of the Pope presided, and approved of all business presented to the council. Certain administrative reforms were early decreed. Bishops were to provide better schools in their dioceses and were themselves to expound the Word of God; qualifications for the episcopal office were defined, and penalties imposed for the neglect of duties; dispensations and privileges were restricted. The Emperor opposed the course of the council, and on March 11, 1547, its sittings were transferred to Bologna, where it was thought the Imperial influence would not be so much felt. In 1549 Paul III died and was succeeded by Cardinal del Monte as Julius III. The latter reassembled the council at Trent, May 1, 1551; but, after the sixteenth session, the city having become insecure on account of the activity of the Protestant forces under Maurice of Saxony, the sittings were again suspended for two years. After the brief reign of Marcellus II, Cardinal Caraffa, one of the ablest leaders of the uncompromising Catholic party, came to the papal throne as Paul IV.

The council now proceeded to carry out a conservative reorganization of the Church, though its work was again suspended for a time owing to the disturbances of Paul's pontificate. Pius IV, the former Cardinal Gonzaga, reconvened it in 1560. Ecclesiastical laws were codified, questions which had hitherto been open were definitely ruled, uniformity of faith and discipline was established. To regulate some of the abuses of the system of indulgences, it was decreed that bishops should collect the payments made in connection with it, while the power of granting indulgences was affirmed as instituted by Christ and to be retained as useful to Christians. Episcopal control of monastic orders was provided for, though the Jesuits secured a larger measure of freedom. Several matters of detail were referred to the Pope for decision. The decrees were read and subscribed by about 200 bishops on Dec. 3 and 4, 1563, and the council finally adjourned. The decrees were confirmed by the Pope, Jan. 26, 1564, and he also prepared a confession of faith summarizing their doctrinal features. (See PIUS IV, CREED OF.) In spite of opposition the work of the council was so clear, logical, and thorough, and so well supported by the hierarchy, that it had a permanent and far-reaching effect, setting the standard of Roman Catholic faith and practice to the present day. The only things added have been the two definitions of the Immaculate Conception and the Infallibility of the Pope.

Bibliography. The best modern edition of the documents relating to the council is *Tridentinum Concilium; Actorum, Epistularum, Tractatuum nova Collectio* (Freiburg, 1901 et seq.), or Theiner, *Acta Genuina Sacri Concilii Tridentini* (Agram, 1874). The approved English translation is that by J. Waterworth (London, 1896); also A. von Druffel, *Monumenta tridentina* (Munich, 1884–87), continued by K. Brandi (1897–99). Works supplementary to that of the council itself were a catechism by the Pope for parish priests and preachers, and authentic editions of the Vulgate Bible, the missal, and the breviary. A permanent tribunal at Rome, the Congregation of the Council, deals with questions which arise as to the meaning, authority, or effect of the decrees and canons of the council. The contemporary histories of the council were those of Fra Paolo Sarpi (see SARPI, PAOLO), *Istoria del Concilio Tridentino* (London, 1619; in Latin, 1620; Eng. trans. by Brent, 1676), written from a hostile, almost a Protestant, point of view; and Sforza Pallavicini, *Istoria del Concilio di Trento* (Rome, 1656–57; revised by the author, 1666; ed., annotated by Zaccaria, 1833; Fr. trans. by Migne, Paris, 1844), a friendly history, a reply to Sarpi. Consult also: Joseph Mendham, *Memoirs of the Council of Trent* (London, 1834–42); I. H. Wessenberg, *Die grossen Kirchenversammlungen des fünfzehnten und sechzehnten Jahrhunderts* (Constance, 1840), a Roman Catholic work; Göschl, *Geschichtliche Darstellung des grossen allgemeinen Concils zu Trient* (Regensburg, 1840); L. Maynier (pseud.), *Etude historique sur le concile de Trente* (Paris, 1874); J. J. I. von Döllinger, *Sammlung von Urkunden zur Geschichte des Konzils von Trient* (Nördlingen, 1876); W. Arthur, *The Pope, the Kings, and the People* (2 vols., London, 1877); Martin Philippson, *Les origines du catholicisme moderne: La contre-révolution religieuse au XVIème siècle* (Paris, 1884); Charles Dejob, *De l'influence du concile de Trente sur la littérature et les beaux-arts* (ib., 1884); R. F. Littledale, *History of the Council of Trent* (London, 1888); J. A. Froude, *Lectures on the Council of Trent* (ib., 1896); A. R. Pennington, *The Counter-Reformation in Europe* (ib., 1901); *Cambridge Modern History*, vol. iii (New York, 1905), containing an exhaustive bibliography.

TRENT, WILLIAM PETERFIELD (1862–). An American literary critic, born in Richmond, Va. He was educated at the University of Virginia and at Johns Hopkins. From 1888 to 1900 he was professor of English and history in the University of the South (Sewanee, Tenn.), and from 1893 to 1900 was dean of the academic department of that institution. In 1900 he became professor of English literature at Columbia. The *Sewanee Review*, which he founded in 1892, was edited by him until 1900. In 1904 he turned his attention mainly to the life of Daniel Defoe and to English history and literature of the period 1680–1730. He contributed the article on Defoe, as well as articles on American literature, to the NEW INTERNATIONAL ENCYCLOPÆDIA, edited *Robinson Crusoe*, and wrote a biography and bibliography of Defoe in 10 volumes (in manuscript to 1916). In addition he edited various works and published: *William Gilmore Simms* (1892); *The Authority of Criticism* (1899); *Robert E. Lee* (1899); *John Milton* (1899); *Progress of the United States during the Nineteenth Century* (1901); *A History of American Literature* (1903); *Greatness in Literature, and Other Papers* (1905); *Longfellow and Other Essays* (1910); *Great American Writers* (1912), with John Erskine.

TRENT AFFAIR, THE. A diplomatic episode growing out of the seizure by an American vessel on Nov. 8, 1861, during the Civil War in America, of two Confederate commissioners on board a British mail steamer. In the autumn of 1861 the Confederate government sent John Slidell and James M. Mason (qq.v.) as commissioners to France and England respectively. They embarked at Havana for England on the

British mail steamer *Trent*. On November 8 Capt. Charles Wilkes (q.v.) of the United States vessel *San Jacinto* stopped the *Trent* and took them as prisoners. This act was applauded by many people, but President Lincoln and Secretary of State Seward recognized its impropriety and disapproved it, and when a formal demand was made by the British Minister for the surrender of the commissioners it was complied with and an apology tendered, on the ground that they had been forcibly taken from a neutral vessel on the high seas and upon a voyage from one neutral point to another. Consult T. L. Harris, *The Trent Affair* (Indianapolis, 1896), containing a bibliography, and C. F. Adams, *The Trent Affair: An Historical Retrospect* (Boston, 1912).

TRENTE ET QUARANTE, träɴ′-tâ kä′-räɴt′. See Rouge et Noir.

TREN′TON. A town and port of entry of Hastings County, Ontario, Canada, on both banks of the Trent, at its outlet in the Bay of Quinté, Lake Ontario, and on the Canadian Pacific, Grand Trunk, and Canadian Northern railways (Map: Ontario, H 5). It is the southern terminus of the Trent Valley Canal and has various manufactures. Pop., 1901, 4217; 1911, 3988.

TRENTON. A city and the county seat of Grundy Co., Mo., 83 miles east by north of St. Joseph, on Grand River, and on the Chicago, Rock Island, and Pacific, and the Quincy, Omaha, and Kansas City railroads (Map: Missouri, C 1). It has the Jewett Norris Free Public Library and the Wright Hospital. Trenton is largely interested in coal mining. The Chicago, Rock Island, and Pacific Railroad maintains repair and machine shops here. The chief manufactures are ice, canned goods, and brick and tile. Large shipments of poultry are made. Trenton was settled in 1840 and was first incorporated in 1857. Pop., 1900, 5396; 1910, 5656.

TRENTON. The capital of New Jersey and the county seat of Mercer County, situated at the rapids on the Delaware River, head of tidewater navigation, and on the Delaware and Raritan Canal, on the main line of the Pennsylvania and of the Philadelphia and Reading railroads, 33 miles northeast of Philadelphia and 59 miles southwest from New York (Map: New Jersey, C 3). Electric lines gridiron the city and the southern portion of the State, reaching to Philadelphia, to north Jersey, and to New York, while there is a large traffic on the canal and by steamships and barges on the Delaware to the south. Bridges over the Delaware connect the city with Morrisville in Pennsylvania.

As a manufacturing centre it is conspicuous among other things for its pottery-ware output. In this industry there are 42 plants, making all the way from the commoner varieties to the finer decorated porcelain and china. The total estimated annual value of these products is about $9,000,000, in the making of which 6000 persons are employed. The ironworks and wire mills, said to be the largest of the kind in the world, have 7000 employees and turn out from 80,000 to 100,000 gross tons of products annually. There are also vast manufactures of rubber products, brick and tile, electrical machinery, castings, malt products, linoleum, woolen goods, and many miscellaneous iron, steel, and other industries. Total capital invested in manufacturing (1914), $55,535,000; total value of manufactures (1914), $53,588,000. The public library contains 73,094 volumes. There are four theatres and 15 moving-picture houses. Educational facilities include the State Normal and Model School, the School of Industrial Arts, three private schools, and a Catholic college. There were 15,569 public-school pupils enrolled in 1915 and 5376 in other schools. There are also three hospitals, the State Home for Girls, a reformatory, the State Hospital for the Insane, and the State Prison. Among the more important public buildings are the State Capitol, Masonic Temple, and State Armory. Notable, also, is the old stone barracks, built in 1758–59 during the French and Indian War. There are two parks, and a large statue of Washington marks the spot where he planted his cannon at the battle of Trenton.

The total assessed value of Trenton real estate in 1915 was $69,948,350; the funded debt, $5,703,796; and its total annual expenditures are $1,615,319. The annual outlay for schools is $508,594; for police, $177,807; for fire department, $166,748; and for street lighting, $75,000. In 1911 Trenton adopted the commission form of city government. It has five commissioners—public affairs, revenue and finance, public safety, streets and public improvements, and parks and public property. Each commissioner has absolute control of his own department, but is also individually responsible to his fellow commissioners and to the public. The mayor is director of public affairs and an adviser of the other commissioners.

Pop., 1790, 1946; 1810, 3002; 1850, 6461; 1870, 22,874; 1880, 29,910; 1890, 73,307; 1910, 96,815 (1915), 103,581. The city has an excellent municipally owned water-supply service and ample sewerage. The municipality's reservoirs have a total capacity of 120,000,000 gallons.

First settled about 1676, Trenton was generally known as The Falls until in 1719 it received its present name in honor of William Trent, Speaker of the House of Assembly. It was incorporated as a borough in 1746, was selected as the State capital in 1790, and was chartered as a city in 1792. In 1776 it was occupied by the British in their pursuit of General Washington. Late in December, 1776, Washington planned a movement against Trenton and Bordentown. At the former was Colonel Rahl with about 1500 Hessians, and at the latter General Donop with a small force. Gen. James Ewing with about 550 men was to cross the Delaware just below Trenton, seize the Assanpink, and thus sever communication between Donop and Rahl; Col. John Cadwalader was to cross at Bristol, below Bordentown, and attack Donop from the south; and General Putnam with about 1000 men was to coöperate with about 1000 men from Philadelphia. The main movement, however, was to be made by Washington in person, who with 2400 men was to cross at McConkey's Ferry, 9 miles above Trenton, and assail Rahl at Trenton. The movement was set for the night of December 25–26. By reason of storms and of the river being clogged with ice, Ewing and Cadwalader were unable to effect a crossing, while Putnam was detained in Philadelphia. Washington, however, with the aid of Marblehead fishermen under Glover, crossed in spite of all obstacles by three o'clock in the morning of the 26th, began his march to Trenton at about four o'clock, and at about eight completely surprised the garrison, which, after a night of Christmas festivities, had taken little precaution against surprise and had made little preparation for resistance. Rahl was soon forced to surrender, and Washington secured about 1000 prisoners. The American loss was 2 killed and 3 wounded, while the Hessians lost about 40 killed or wounded. Soon afterward Washington recrossed the Delaware to his former position. This success, together with that at Princeton on Jan. 3, 1777, greatly revived the spirits of the Americans and did much to prevent the threatened disintegration of Washington's army. Trenton became the State capital in 1790 and served as the temporary capital of the country in 1784 and 1793. Consult: J. O. Raum, *History of the City of Trenton* (Trenton, 1871); S. A. Drake, *The Campaign of Trenton, 1776–77* (Boston, 1895); Lee, *History of Trenton* (Trenton, 1895); W. S. Stryker, *The Battles of Trenton and Princeton* (Boston, 1898); J. M. Lathrop, *Atlas of the City of Trenton and Borough of Princeton* (Philadelphia, 1905); Ernest Volk, *Archæology of the Delaware Valley*, published by the Peabody Museum (Cambridge, Mass., 1911).

TRENTON FORMATION. One of the divisions of the Ordovician system, consisting mainly of limestones and black carbonaceous shales, so named from the type locality at Trenton Falls in central New York. The rocks are distributed in belts along the eastern, southern, and western borders of the Adirondacks; they also occur on the northern shores of Lake Ontario in Canada, in the upper Mississippi valley, and elsewhere in the Central West. In Ohio and Indiana Trenton rocks are the source of oil and gas; while the limestones of the formation are important quarry materials, being utilized for building stone, lime manufacture, and as an ingredient of Portland cement. The black limestones are sometimes polished and sold as black marble. See Ordovician System.

TRE′PANG (from Malay *tripang*), or Bêche de Mer. The dried body of a holothurian (q.v.), regarded as good food by the Chinese. They are usually 8 or 9 inches long, but some are 2 feet in length. They are often found in the coral sand, the tentacles only appearing above it. Large ones are sometimes speared in shallow water; but most are taken by divers. Macassar is the centre of the trade, whence several hundred tons are annually sent to China. Trepang is also gathered and prepared to some extent in California. It is gelatinous and nutritious, though almost tasteless, and is an ingredient in soups.

TREPHINE, trê-fīn′ *or* trê-fēn′, **TREPHINING** (Fr. *tréphine*, for **trépine*, dim. of *trépan*, trepan, from ML. *trepanum*, from Gk. *τρύπανον*, *trypanon*, auger). The operation of trephining consists in the perforation of a bone by means of a trephine, which is a small cylindrical or circular saw, with a centre pin on which it works. The trephine produces a hole in the skull varying from ¼ to 1 inch or more in diameter. It is customary to make as small an opening as possible with the trephine, enlarging it when necessary by means of rongeur forceps, the chisel, or some special form of saw. Trephining is especially employed in fracture of the skull where the fragments of bone cannot otherwise be raised. In other conditions the operation of trephining is often a mere introductory step, giving a point of entrance at one or more places from which extensive flaps of bone are broken away or turned back for free access into the cranial cavity.

TRÉPORT, trā′pôr′, Le. A town of the Department of Seine-Inférieure, France, situated at the mouth of the Bresle, under a high cliff 45 miles north-northeast of Rouen. Its proximity to Paris has made it a popular bathing resort. Le Tréport has a sixteenth-century tower, now used as the town hall, the sixteenth-century church of Saint-Jacques, an old Renaissance timber house, and a conspicuous casino. There is a considerable trade. Sugar is the leading export. The harbor is good, and a canal extends to Eu. Pop., 1901, 4949; 1911, 4958.

TREPOV, trā′pôf, Dmitry Feodorovitch (1855–1906). Russian soldier and administrator. He was a son of the chief of police in St. Petersburg whose attempted assassination by Viera Zasulitch (q.v.) in 1878 constitutes one of the earliest events of the Russian revolutionary movement. Dmitry entered the army in 1874, fought in the Russo-Turkish War of 1877–78, and retired in 1896 with the rank of colonel to become chief of police in Moscow. Because of the brutalities practiced by the police against the students, he was removed in January, 1905, but after the massacre of "Red Sunday" in St. Petersburg (Jan. 22, 1905), he came to the capital and was appointed Governor-General of St. Petersburg with extraordinary powers. Later in the year he became Assistant Minister of the Interior with control of the police throughout the Empire. In December he was made commandant of the Imperial palace. He escaped assassination in July, 1906, but died a few months later of heart failure. See Russia.

TRES′COT, William Henry (1822–98). An American diplomatist, born at Charleston, S. C. He graduated at Charleston College in 1840, studied law in Harvard and was admitted to the bar in 1843, became Secretary of the United States Legation in London in 1852, and was Assistant Secretary of State from June, 1860, until the secession of South Carolina. A part of this period he was also the confidential agent of his State. In 1862–66 he served in the State Legislature and was also on the staff of General Ripley. In 1877 he was one of the agents of the United States Fishery Commission at Halifax; in 1880 helped to revise the treaties between the United States and China; in 1881 was sent as special envoy to Chile, Bolivia, and Peru, which were then at war; and in 1882 was associated with General Grant in negotiating a new treaty with Mexico. Among his published works are: *Diplomacy of the Revolution* (1852); *An American View of the Eastern Question* (1854); *Diplomatic History of the Administrations of Washington and Adams* (1857).

TRESGUERRAS, trâs-gãr′râs, Francisco Eduardo (1745–1833). A Mexican architect, born at Celaya. He began his artistic career as a painter and a sculptor in wood; studied in the Academy of San Carlos in Mexico City and probably for a while under Jesuit teachers, but was largely self-taught as an architect. He nevertheless achieved remarkable success in the designing of religious and civic buildings, as in the church of Nuestra Señora del Carmen at Celaya, a theatre at San Luis Potosí, the bridge of La Laja, and conventual churches at Querétaro, San Miguel de Allenda, and elsewhere. He was a successful painter and widely known also as a musician and poet.

TRESHAM, trĕsh′*a*m, Francis (c.1567–1605). An English conspirator. He participated in Essex's rebellion in 1601, for this was imprisoned, and in 1602 was implicated in Thomas Winter's mission to the King of Spain. Initiated into the Gunpowder Plot (q.v.), he disapproved of the plans and revealed the plot to Lord Monteagle, his brother-in-law. Later he was arrested, and died in prison.

TRESPASS (Lat. *trans*, across + *passus*, pace, OF. *trespasser*, to pass over, depart). In law, the injury to person or property resulting from some wrongful act committed with force. The term at common law meant a certain form of action. In modern law it includes several kinds of torts and is sometimes used as equivalent to tort. Although trespass means either an injury to person or one to property, it is more commonly used in regard to land. Assault and battery and false imprisonment are examples of trespass to the person. The rigidity of common-law pleading made the distinction between action in trespass and actions on the case, e.g., negligence, essential, but modern law has done away with form and looks rather to the matter. An interference with the possession of personal property is a trespass. Such would be the wrongful carrying away of property even with no intention of converting or injuring it.

Trespass to lands is an unauthorized entry thereon. Although no damage result, it is yet trespass. An entry need not be by person. It may be made by beasts, as driving or allowing cattle to stray on another's land, or by throwing something thereon, as in blasting, or attaching anything thereto, such as the posting of an advertisement on a house or the erection of a building. In the view of the law every man's land is presumed to be separated from that of his neighbor by a close or boundary. This may be an actual fence, but the law implies an invisible and effectual boundary, and it is the unauthorized crossing over this line which constitutes the trespass. The entry may have been at first lawful and unauthorized, but the person entering may later become a trespasser. Thus, the purchaser of a ticket to a theatre is licensed to enter, but if he afterward create a disturbance and is requested to leave and refuses, the license having been revoked, he is a trespasser. Inevitable accident, or, e.g., where a highway is obstructed and it is necessary to pass over the lands by the side, is a defense to an action. Generally, however, the intent is immaterial and it is the act itself. A trespass committed by mistake is nevertheless actionable. But when the act is willful or malicious the intent is considered with relation to the question of damages, and in some jurisdictions statutes have made certain acts criminal trespass, allowing exemplary damages. In New York State treble damages are authorized for entering another's land and cutting timber thereon, in Missouri for taking coal. At common law no trespass was a crime unless it amounted to a breach of the peace. Even when the owner or possessor has put up notices "Trespassers will be prosecuted," it is not a crime except under statutes which usually apply to inclosed or cultivated land.

The entry must be unauthorized. The law implies a license where necessary to exercise a public right or to prevent a great public disaster, as blowing up a building to prevent the spread of fire. Authority from the government may be a justification of an act which would in the absence thereof be a trespass. An entry by commissioners appointed by the State to make plans or ascertain boundaries is an example, or the entry of an officer or person assisting him in the execution of a search warrant. But the entry of an officer without the authority of a warrant is a trespass. In general, the law is that no entry is authorized in the execution of civil process, as in the service of a subpœna. The maxim that "A man's home is his castle" expresses the general view of Anglo-Saxon law. Damages are based on the actual injuries, although they may be slight or nominal, such as the trampling down of grass. The owner may use all the force necessary to prevent a trespass or to eject a trespasser, but if he use more force than is necessary he becomes liable in tort for assault and battery. There are many circumstances under which persons are invited by implication to go upon the property of others and so do not become trespassers. Thus, it is no act of trespass to enter the house of a neighbor upon matters of business or for a social call; so keepers of hotels, stores, and theatres hold out to the public a general invitation to enter. Again, it has been held that a person who by contract has become the owner of property which is on the land of the seller may enter and take his property unless he is forbidden to do so. If an owner of land has wrongfully acquired possession of personalty and placed it on his own land, the rightful owner may retake it.

The person who may maintain an action may be either the owner or possessor. Possession usually gives the right, but ownership without possession allows a right of action for permanent injuries. A continuing or threatened trespass may be restrained by injunction.

Consult: Pollock and Maitland, *History of English Law before the Time of Edward I* (2d ed., 2 vols., Cambridge, 1903); J. N. Pomeroy, *Code Remedies: Remedies and Remedial Rights* (4th ed., Boston, 1904); Sir Frederick Pollock, *The Law of Torts* (8th ed., London, 1908).

TRES′SURE. In heraldry (q.v.), a subordinary, half the width of the orle (q.v.).

TREU, troi, GEORG D. C. (1843–). A German archæologist, born at St. Petersburg. He was educated at the universities of Dorpat and Berlin. In 1866–73 he lived in St. Petersburg, and thereafter till 1882 he taught at the University of Berlin. In 1877–81 he had an important part in the excavations at Olympia. His publications include: *Hermes und Praxiteles* (1878); *Ausgrabungen von Olympia*, vols. iii–v (1879–81), with Curtius, Adler, and Dörpfeld; *Bildwerke von Olympia in Stein und Ton* (1894–97); *C. Meunier* (1898); *Max Klingers Dramagruppe* (1900); *Olympische Forschungen*, vol. i (1907); *Hellenische Stimmungen in der Bildhauerei von einst und jetzt* (1910).

TREVELYAN, tre-vĕl′yan, SIR CHARLES EDWARD (1807–86). An Anglo-Indian official. He was born at Taunton, Somersetshire, received his education at the Charterhouse and Haileybury College, entered the East India Company's civil service, and in 1827 went to Delhi as assistant to Sir Charles Theophilus Metcalfe, chief commissioner. In 1840 he was appointed Assistant Secretary to the Treasury, retaining the position until 1859. With Sir Stafford Northcote he prepared in 1853 a report entitled *The Organization of the Permanent Civil Service*, which is the basis of all subsequent civil-service legislation. In 1848 he was made Knight Commander of the Bath and in 1859 was appointed Governor of Madras. He was appointed Finance Minister in India in 1862 and retired in 1865 on account of ill health. Important reforms were made in the system of accounts during his financial administration and the resources of India developed by a great expansion of public works. He was created Baronet in 1874. Trevelyan was the author of several valuable treatises, some of his better-known works being: *Education of the People of India* (1838); *The Irish Crisis* (1848); *Christianity and Hinduism* (1882).

TREVELYAN, George Macaulay (1876–). An English historian, a son of Sir George Otto Trevelyan (q.v.), educated at Harrow and at Trinity College, Cambridge. His writings comprise chiefly: *England in the Age of Wycliffe* (1899); *England under the Stuarts* (1904); *The Poetry and Philosophy of George Meredith* (1912); *Garibaldi's Defense of the Roman Republic* (1907); *Garibaldi and the Thousand* (1909); *Garibaldi and the Making of Italy* (1911); *The Life of John Bright* (1913); *Clio, a Muse, and Other Essays* (1913).

TREVELYAN, Sir George Otto (1838–). An English statesman and author, the only son of Sir Charles Edward Trevelyan (q.v.) by his wife, Hannah More Macaulay, sister of Lord Macaulay. He was born at Rothley Temple, Leicestershire, and was educated at Harrow and at Trinity College, Cambridge. After a short period in the East Indian civil service, he entered Parliament in the Liberal interest for Tynemouth (1865) and for the Hawick Burghs (1868). He represented the Bridgeton Division of Glasgow from 1887 to 1897, when he resigned. He was appointed Civil Lord of the Admiralty under the first Gladstone administration (December, 1868), but resigned (July, 1870) owing to disagreement with the Premier on the Education Bill. In the second Gladstone administration he became Parliamentary Secretary to the Admiralty (November, 1880), Chief Secretary for Ireland (May, 1882), and Chancellor of the Duchy of Lancaster (1884). At the beginning of the third Gladstone administration he was appointed Secretary for Scotland (1886), but he resigned (March, 1886) because of the bill for establishing an Irish Parliament. And again in the last Gladstone administration he was Secretary for Scotland (1892–95). Trevelyan was a leader in the abolition of the purchase of commissions in the army and in the extension of household suffrage to the counties. Among his publications are: *The Competition Wallah* (1864); *Cawnpore* (1865); *The Ladies in Parliament, and Other Pieces* (1868); *The Life and Letters of Lord Macaulay* (1876); *The Early History of Charles James Fox* (1880); *Interludes in Prose and Verse* (1905); *The American Revolution* (4 vols., 1899–1909), a notably valuable work; *George III and Charles James Fox* (vol. i, 1912; vol. ii, 1914).

His son and heir, Charles Philips Trevelyan, was a Liberal member of Parliament after 1899. From 1908 to 1914 he was Parliamentary Secretary of the Board of Education, resigning because he opposed England's participation in the European War. See also Trevelyan, George Macaulay.

TREVEN'A, John, pseudonym of an English novelist, Ernest George Henham (c.1873–). Attacked by consumption in his seventeenth year, Henham led a wandering and often necessitous life, seeking health at home and abroad, and finding it finally 20 years later by living upon Dartmoor, the scene of his most characteristic novels. Those of his books which were published under his own name include: *Menotah: A Tale of the Canadian North West* (1897); *God, Man, and the Devil* (1897); *Trenbrae* (1897); *Bonanza: A Story of the Outside* (1901); *Soud: The Story of a Feud* (1902); *The Plowshare and the Sword* (1903); *Krum: A Study of Consciousness* (1904); *The Feast of Bacchus: A Study in Dramatic Atmosphere* (1907). The books that appeared under his pseudonym were: *A Pixy in Petticoats* (1906); *Furze the Cruel* (1907), one of his best novels; *Arminel of the West* (1907); *Heather* (1908); *The Dartmoor House that Jack Built* (1909); *Granite* (1909); *Wintering Hay* (1912); *Sleeping Waters* (1913); *Adventures among Wildflowers* (1914); *Matrimony* and *Moyle Church Town* (both 1915). Consult F. T. Cooper, *Some English Story Tellers* (New York, 1912).

TREVES, trēvz (Ger. *Trier*). A city of Prussia, in the Rhine Province, on the right bank of the Moselle, 69 miles southwest of Coblenz (Map: Germany, B 4). It is situated in a region of hills, vineyards, and woods and presents a picturesque appearance. The town lies in a compact form, surrounded on three sides by promenades called allées. In the old city proper the streets are narrow and crooked. On the north is the Porta Nigra, an enormous fortified gateway—a splendid Roman relic. In the northeastern part of the city stands the cathedral, one of the oldest churches in Europe. The ancient edifice on whose site it stands appears to have been used as a church already in Roman times. The building has been repeatedly restored as the result of wars and the ravages of centuries. It is regarded as the most important pre-Carolingian church in Germany. Among its contents are an alleged nail from the cross and the famous seamless "Holy Coat." There are fine cloisters leading to the charming church of Our Lady (Liebfrauenkirche), an early Gothic structure said to date from 1143 and to be the oldest Gothic church in Germany.

In the southeastern part of Treves is the spacious Palace Square, at the north end of which stands a brick basilica dating probably from the early part of the fourth century, restored in 1846–56 and now used as a Protestant church. At the south end of the square is the Roman palace, a picturesque mass of ruins. The valuable provincial museum is near by. Among its remarkable antiquities are 60 hermæ, torso of Cupid, torso of an amazon, a mosaic credited to Monnus, and the Roman tombs from Neumagen, dating from the beginning of the Christian era and representing the costumes and daily life in this region at that period. A short distance southeast of the city is a Roman amphitheatre, built in Trajan's time. In the southwestern part of Treves, close to the Moselle, are the Roman baths, a vast and impressive ruin.

The municipal library, containing over 102,500 volumes and manuscripts, is connected with the Gymnasium and possesses rare works of ancient date. Among them is the illuminated Codex Egberti, dating from the close of the tenth century. There are also the Codex Aureus and the Fust and Gutenberg Bible of 1450. The manufacturing interests are varied and important. There are tanneries, iron foundries, dye works, furniture and piano factories, glass-painting works, etc. The trade is extensive in wine, fruit, and wood. The town possesses a school of viticulture. There are many mines in the vicinity, including lead, copper, and tin mines. Pop., 1900, 43,324; 1910, 54,827.

History. Treves is usually considered the most ancient town of Germany. It was the capital of the Celtic Treviri, from whom it took its name (anciently Augusta Trevirorum). The Romans made it a colony, and it grew in importance. It was an Imperial residence in the later times of the Roman Empire, which explains the presence of the magnificent Roman relics. Treves had a bishop at a very early date. It fell into the hands of the Franks about the middle of the fifth century. The see appears to have been erected into an archbishopric soon after the beginning of the ninth century. In 870 the city, after having for a time belonged to Lorraine, was permanently united with Germany. It rose to great importance under its archbishops, who exercised temporal sway over a considerable district and who held a place among the Imperial Electors. After a long struggle with its ecclesiastical overlords, Treves was recognized as a free city towards the close of the sixteenth century. The French took Treves in 1794, and within a few years nearly the whole of the archiepiscopal see was in their possession. The archbishopric was abolished. The Congress of Vienna (1814–15) handed the city and the former see over to Prussia. Treves was bombarded by an allied aërial force in the great war which began in 1914. See WAR IN EUROPE. Consult: J. N. von Wilmowski, *Der Dom zu Trier* (Treves, 1874); E. A. Freeman, *Historical and Architectural Sketches* (London, 1876); Woerl, *Führer durch die Stadt Trier* (9th ed., Leipzig, 1905).

TREVES, SIR FREDERICK (1853–). A British surgeon, born in Dorchester and educated at the Merchant Taylors' School. He was Hunterian professor of anatomy and Wilson professor of pathology at the Royal College of Surgeons from 1881 to 1886 and examiner in surgery at Cambridge in 1891–96. From 1905 to 1908 he served as lord rector of Aberdeen University. In the South African War (1900) he was consulting surgeon and served with the Ladysmith relief column. In 1900–01 he was surgeon extraordinary to Queen Victoria, and in 1902 he operated upon King Edward VII for perityphlitis. In the latter year he was created Baronet. He was especially successful in operations for intestinal obstruction, appendicitis, and peritonitis. Notable among his many medical works is *System of Surgery* (1895). Treves also published books on travel, war experiences, etc.

TREVET, NICHOLAS. See TRIVET, NICHOLAS.

TREVI, trā′vē, FOUNTAIN OF. A noted fountain in Rome, with which the superstition is connected that a traveler's return to Rome is assured by dropping a coin in its basin and drinking its waters. It is built against the façade of the Palazzo Poli and was completed in 1762. The water of the ancient Aqua Virgo spouts from the rock crevices and from the nostrils of Neptune's horses, above the fountain.

TRÉVILLE, LOUIS RENÉ VASSOR, VISCOUNT DE LA TOUCHE-. See TOUCHE-TRÉVILLE, L. R. V.

TREVISO, trā-vē′zō. The capital of the Province of Treviso, Italy, situated in a fertile valley on the Sile, 18 miles north by west of Venice (Map: Italy, D 2). It is connected with the lagoons of Venice by a canal. The town has a mediæval appearance with its high walls flanked with bastions. The imposing twelfth-century cathedral, restored in the fifteenth century, has five cupolas. The Gothic church of San Niccolò has a curious wooden roof and is adorned with admirable frescoes. The Borgo Cavour contains a library of over 50,000 volumes and a picture gallery. Among the educational institutions are a technical school, a school of navigation, a bishop's seminary, and an academy of sciences. The city manufactures silk and woolen goods, metal ware, machinery, chemicals, and paper. Pop. (commune), 1901, 33,987; 1911, 40,219. Treviso, the Roman Tarvisium, was an important city towards the end of the Roman Empire. It figured among the cities of the Lombard League. It came under the rule of Venice in the fourteenth century. In 1797 it was taken by the French under Mortier, who received the title of Duke of Treviso.

TREVISO, DUKE OF. See MORTIER, E. A. C. J.

TREV′ITHICK, RICHARD (1771–1833). A British mechanical engineer and inventor, distinguished for his improvements of the steam engine and as the designer of the first practicable locomotive. He was born at Illogan in Cornwall and received a common-school education previous to becoming an engineer in the mines in his vicinity. Engaged in the construction of pumping and other engines, he was associated with Murdock, Bull, and other well-known engineers and was constantly experimenting with machinery. He effected various improvements in pumps and designed a high-pressure steam engine in 1800 which was soon in wide use in the mines of Cornwall and Wales. Turning his attention to the designing of steam vehicles, as early as 1796 he made a number of models on a small scale and in 1801 completed and operated a full-size vehicle for which he received a patent in the following year. This steam carriage was so successful that Trevithick with the assistance of Andrew Vivian was led in 1804 to build a locomotive engine to operate on the Merthyr Tydfil tram road. This was the first application of steam to the hauling of loads on a railway and led to the construction of further steam locomotives operating on rails, including one which was exhibited in London in 1808 on a circular track. As Trevithick understood that the friction of the wheels on the rails was sufficient for the traction of cars on ordinary grades (in distinction from other inventors who employed a cog and rack), and as he was the first to use a return flue boiler and a steam jet in the chimney, and to couple together the wheels of a locomotive, he is considered by many entitled to the credit of being the real inventor of the locomotive steam engine. It is, however, to Stephenson (q.v.) that we must look for the perfection of a practical application of the machine. See LOCOMOTIVE; RAILWAYS.

In 1816 Trevithick went to Peru, where a number of his engines had been introduced into the silver mines, and, after being successful in several undertakings, lost his entire property through the outbreak of war. At Cartagena in 1827 he encountered Robert Stephenson (q.v.), who assisted him to return to England. The remainder of his life was spent in further experiments, few of which came to a successful outcome, and he died in poverty. While Trevithick reaped but little material reward for any of his inventions, yet he made many discoveries which were of the greatest use to other engineers when practically applied and successfully developed. Consult: Smiles, *Lives of Engineers* (London, 1861); Francis Trevithick, *Life of Richard Trevithick* (ib., 1872); E. K. Harper, *A Cornish Giant, Richard Trevithick: The Father of the Locomotive-Engine* (ib., 1913).

TRIAD (from Lat. *trias*, from Gk. *τριάς*, number three, triad, from *τρεῖς*, *treis*, three). In music a chord of three tones built upon any tone with its third and fifth above. According to the character of the intervals (major, minor, augmented or diminished) the character of the triad varies materially. See HARMONY, *Chords*.

TRIAL (OF. *trial*, from *trier*, to try, choose, thresh, from ML. *tritare*, to thresh, rub, frequentative of Lat. *terere*, to rub, thresh). A regular and formal examination or inquiry into the material facts of a controversy in issue before a competent tribunal, in order finally to determine the respective rights of the parties thereto. Trials may be divided into two classes —those by a judge and jury and those before a judge without a jury. In a legal action the trial is usually before a jury. (For the ordinary steps in a jury trial, see JURY.) In courts of equity trials are conducted before the chancellor or judge without a jury, substantially in the same manner as in a jury trial. The codes of reformed procedure and practice acts in most of the United States regulate the details of trials in their various courts. See EVIDENCE; JURY; NOLLE PROSEQUI; NONSUIT; PLEADING; PRACTICE; ETC.; and consult authorities under EVIDENCE; JURY; PLEADING; ETC.

TRIAL BY BATTLE. See BATTLE, TRIAL BY; ORDEAL.

TRIAL BY JURY. The first comic opera by Gilbert and Sullivan (see GILBERT, SIR W. S.; SULLIVAN, SIR ARTHUR), first produced in London, March 25, 1875.

TRI'ANGLE (Lat. *triangulus*, three-cornered, from *tres*, three + *angulus*, angle). A figure formed by three intersecting lines. The sides of a plane triangle are straight lines, and those of a spherical triangle are geodetic lines or arcs of great circles. Triangles are called equilateral, isosceles, and scalene according as three sides, two sides, or no sides are equal, but the word "scalene" is rarely used. Of two angles of a plane triangle, the one which is opposite the greater side is the greater, but the angles do not vary as the sides, the ratio of two sides being equal to that of the sines of the opposite angles. (See TRIGONOMETRY.) In a spherical triangle the sines of the sides are proportional to the sines of the opposite angles. The sum of the angles of a plane triangle is 180° according to Euclidean geometry (see GEOMETRY), but in the case of a spherical triangle the sum varies from 0° to 540°. The geometry of the triangle is extensive, and a few of the most important propositions are given under CONCURRENCE AND COLLINEARITY and MAXIMA AND MINIMA. The area of any plane triangle is given by the formulas $\Delta = \frac{bh}{2}$ and $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$; where b is the base, h the altitude, a, b, c the sides, and s the semiperimeter. In case the triangle is equilateral, $\Delta = \frac{a^2\sqrt{3}}{4}$, where a is the side. If one angle of a plane triangle is a right angle, the triangle is called a right-angled triangle, the side opposite the right angle being the hypotenuse. In the United States the term "right triangle" is commonly used for "right-angled triangle." The spherical triangle of one, two, or three right angles is called a rectangular, birectangular, or trirectangular triangle respectively. The spherical triangle in which one, two, or three sides are quadrants is called a quadrantal, biquadrantal, or triquadrantal triangle respectively. The area of a spherical triangle is given by the formula $\Delta = \frac{\pi R^2 E}{180}$, where R is the radius of the sphere and E the spherical excess (q.v.), or $A + B + C - 180°$. Consult Catalan, "Quelques formules relatives aux triangles rectilignes," in the *Mémoires couronnés* of the Brussels Academy (1891), and Casey, *Sequel to Euclid* (5th ed., Dublin, 1888).

TRIANGLE. A musical instrument consisting of a steel rod bent into a three-sided figure open at one angle. It is hung by a cord at the upper angle and attached to the performer's left hand, to his desk, or to his drums. Modern composers frequently use it in marches, dances, and fantasias. As it is used only for rhythmic figures, the music is written, as for drums and other instruments without fixed pitch, upon a single line.

TRIANGLE. In architectural and engineering drafting, an instrument of wood, hard rubber, or celluloid for drawing lines at given angles to the T-square. There are two forms commonly used, both having one right angle and two acute angles, of 45° in the one form and, in the other, of 30° and 60°.

TRIANGLE OF FORCES. See MECHANICS.

TRIANGLE SPIDER. A spider (*Hyptiotes cavatus*) of the family Uloboridæ, common in the eastern United States. Its web is usually stretched between the twigs of dead branches and at first appears like the fragment of an orb web. It consists of four plain radiating lines and a series of double crosslines. From the apex of the triangle a strong line extends to the supporting twig. The spider stations itself on this line and draws up a slack which when loosened jars the whole web, entangling engaged insects in the cross threads. Consult J. H. Comstock, *The Spider Book* (new ed., New York, 1914).

TRIAN'GULAR NUMBERS. See NUMBER.

TRIAN'GULA'TION. A method used in surveying when the area to be surveyed is of considerable extent. It consists, as the name indicates, in laying out a system of triangles by means of which intermediate points are located. See GEODESY; SURVEYING.

TRIANON, trē'ä'nôN'. The name given to two villas in the Park of Versailles. The Grand Trianon was built in 1685 by Louis XIV for Madame de Maintenon. The Petit Trianon, built by Louis XV in 1766 for Madame Du Barry, was afterward a favorite resort of Marie Antoinette. See Plate of INTERIOR DECORATION.

TRI'AR'THRUS (Neo-Lat., from Gk. *τρεῖς*, *treis*, three + *ἄρθρον*, *arthron*, joint). A genus of Ordovician trilobites with depressed convex carapace of elongate oval outline, of which the middle third is occupied by the broad axis. The thorax has 14 to 16 segments, in the middle of each of which there is a rounded knob, and the pygidium is small and semicircular. The best-known species is *Triarthrus becki* of the Utica shale of North America. See TRILOBITA.

TRIAS'SIC SYSTEM (from Lat. *trias*, number three, triad). A group of rocks immediately following the Carboniferous and preceding the Jurassic system. It is therefore the oldest formation of the Mesozoic era. The rocks of this system were at first associated with the Permian under the name of the New Red Sandstone (q.v.), but they were finally separated and designated as the Trias by German geologists, who divided the system into three series, the Keuper, Muschelkalk, and Buntersandstein. The Rhætic clays and sandstones were subsequently added to the system.

Much difficulty has been found in subdividing the American Trias and still more in correlating it with the European beds. Indeed, in the United States it is often difficult to separate the Triassic from the Jurassic, and consequently the plan adopted by the United States Geological Survey is to designate them as the Jura-Trias, and consider the deposits as one formation.

The Pacific Coast beds are marine, while those of the Atlantic border are estuarine. In the Eastern States the Triassic formation consists of a series of sandstones and shales extending more or less unbrokenly from the Connecticut valley to South Carolina. The rocks were deposited in shallow water along the continental shores. The Newark rocks are in many places faulted and intruded by igneous rocks, the eruptions having in some cases occurred while the deposition of sediment was still going on, being thus in the nature of submarine outbursts. The Palisades of the Hudson River and the East Rock at New Haven, Conn., are formed of diabase erupted during the Triassic period. Some doubt exists as to whether the Triassic rocks of the Atlantic border were one continuous belt or whether they were deposited in separated troughs. In the interior of the continent along the Rocky Mountains there are extensive beds of red sandstone which were deposited in an inland sea, but whether they belong to the Triassic or Jura-Trias is unsettled. On the Pacific coast the Triassic rocks have a maximum thickness of nearly 5000 feet. Triassic rocks are known in Central and South America, Europe, Asia, and Australasia.

The plant life of the Triassic included ferns, cycads, conifers, and gigantic representatives of the Equiseta, or horsetails. The accumulated remains of these plants contributed to the formation of important coal seams. Among the vertebrates fishes were fairly abundant, the dominant type being ganoids; but the most characteristic class was the Amphibia, which attained its greatest development in this period. Of reptiles the ichthyosaurs, plesiosaurs, dinosaurs, crocodiles, and turtles were present, while the earliest representatives of the Mammalia came into existence.

The Triassic beds of the Atlantic border formerly were quarried extensively, yielding the well-known brownstone once so popular as a building material in the Eastern cities. Deposits of coal are found in the Triassic of Virginia and North Carolina and in parts of Europe, but they are of minor importance compared with the great coal measures of the Carboniferous age.

Bibliography. Darton, "The Relations of the Traps of the Newark System in the New Jersey Region," *United States Geological Survey, Bulletin 67* (Washington, 1890); Russell, "The Newark System," *United States Geological Survey, Bulletin 85* (ib., 1892); Davis, "The Triassic Formation of Connecticut," *United States Geological Survey, 18th Annual Report*, part ii (ib., 1898); Shaler and Woodworth, "Geology of the Richmond Basin, Virginia," in *United States Geological Survey, Nineteenth Annual Report*, part ii (ib., 1899); Kümmel, "The Newark Rocks of New Jersey and New York," in *Journal of Geology*, vii (Chicago, 1899); Lull, "Triassic Life of the Connecticut Valley," in *State Geological and Natural History Survey of Connecticut, Bulletin 24* (Hartford, 1915). See GEOLOGY; PALEONTOLOGY; ETC.

TRIBE (Lat. *tribus*, tribe; possibly connected with *trabs*, beam, Lith. *trobà*, building, OWelsh, OBret. *treb*, habitation, subdivision of the people, OHG. *dorf*, Ger. *Dorf*, Eng. *thorp*, village). A territorial group of varying size, embracing individuals linked together by linguistic, cultural, and perhaps primarily political bonds. It is a matter of judgment whether to regard closely allied groups speaking mutually intelligible dialects as distinct tribes or not. This often depends on the emphasis placed on political independence as compared with, say, similarity of speech. When the term is applied to several groups each of which is restricted to a part of the tribal area, these local subdivisions may be called *bands* or *hordes*. A union of tribes, when definitely organized, is called a *league* or *confederacy*, as in the case of the five Iroquois tribes; while Spencer and Gillen have applied the term "nation" to the much vaguer union of culturally and linguistically related tribes of central and north-central Australia. The essential thing is to confine the term "tribe" to a local unit as contradistinguished from social subdivisions, such as moieties, clans, gentes, or castes.

A few concrete illustrations may elucidate common ethnological usage. The Assiniboin speak merely a dialect of the Dakota language and from this point of view might be classed as one tribe with the Yanktonnais Dakota. Nevertheless, they have broken away so decidedly as a political unit that no one would deny to them the title of a separate tribe. The Blackfoot are sometimes spoken of as a single tribe, comprising as subdivisions the Blood, Piegan, and Northern Blackfoot, while other writers prefer to speak of a union of three distinct tribes. Both usages seem permissible, since here we have certainly a great degree of unity when the Blackfoot divisions are compared with alien groups, while at the same time each preserved an appreciable degree of individuality. In Africa the prominence of the monarchical idea generally simplifies the use of the term. There a tribe comprises usually the entire following of a certain ruler, the political factor even obscuring the territorial principle, i.e., if a king for any reason shifts his headquarters to those of another ruler, the subjects of each would remain distinct units. The term "tribe," then, cannot be rigidly defined, but in its use the territorial and political features are clearly predominant.

TRI'BONIA'NUS. A distinguished Roman jurist of the sixth century A.D. He was of Macedonian parentage, but was born at Side in Pamphylia. He held under the Emperor Justinian (q.v.) the offices of quæstor, master of the Imperial household, and consul. But he is famous chiefly through his labors in connection with the Code of Justinian and the pandects (q.v.). He died in 545.

TRIB'UNE (Lat. *tribunus*, originally a tribal officer, from *tribus*, tribe). In ancient Rome the name "tribune" was applied to two distinct functionaries, the military tribunes (*tribuni militum*) and the tribunes of the plebs (*tribuni plebis*), which will be considered separately. 1. In the traditional organization of the citizens by Romulus (q.v.) the leader of the quota of warriors furnished by each of the three tribes was called *tribunus militum;* and the same was true when the tribes were increased to four under Servius Tullius, when we read also of *tribuni aerarii,* whose duty it was to collect and pay into the treasury the tribal taxes (tribute). (See Rome, *Ancient Rome, History of Rome During the Earliest or Regal Period.*) Under the Republic each legion was under the command of six military tribunes, at first appointed by the consuls (who were the commanders in chief), afterward elected at the *comitia tributa.* (See Comitia.) Their importance was greatly diminished at the end of the Republic, when the actual command of the legion in the field was confided to a skilled officer called *legatus legionis,* and the six *tribuni militum* were retained only as an honorary staff of the general. (See Legion.) With the formal development of the *cursus honorum,* or regular sequence of offices for men of senatorial rank, the military tribuneship took its place in the preliminary service, as a stepping stone by which young nobles might reach the higher positions. Under the Empire the name *tribuni* was given also to the officers of each cohort of the prætorian guard (q.v.), city guards (*cohortes urbanæ*), and night watch (*vigiles*). Consult the works named at the end of 2, below; J. Marquardt, *Römische Staatsverwaltung,* vol. ii (2d ed., Leipzig, 1884); G. H. Allen, "The Advancement of Officers in the Roman Army," in *Supplementary Papers of the American School of Classical Studies in Rome,* vol. ii (New York, 1908); G. L. Cheesman, *The Auxilia of the Roman Imperial Army* (Oxford, 1915).

2. In the early period all the perquisites and prerogatives of government in Rome were in the hands of the patricians, while the plebs, the bulk of the people, had only the burdens of taxation and military service. (See Rome, *Ancient Rome, History of Rome during the Earliest or Regal Period; The Roman Republic from its Institution to the Abolition of the Decemvirate,* Internal History; *From the Abolition of the Decemvirate to the Defeat of the Samnites, etc.,* Internal History.) This galling condition is said to have been partly remedied by the secession of the plebs in 494 B.C., when they secured the right to have annual magistrates, called *tribuni plebis,* chosen from their number to look after their especial interests and needs. These were six in number (at first perhaps five), served for one year, and were reëligible. They were invested with three important privileges: (1) *ius auxilii,* the right to defend a plebeian on any charge; (2) *intercessio,* the right of vetoing any measure proposed by the Senate (q.v.); (3) personal inviolability during their term of office. After 471 B.C. the tribunes were regularly elected by the popular *comitia tributa.* (See Comitia.) The power and energy of the plebeian tribunes were responsible for the gradual extension of political rights to all the people, and to the struggle between the patricians and plebeians that marks the history of the Republic. They caused the codification of the laws (Twelve Tables) in 451 B.C.; the recognition of the popular decrees (*plebiscita*) as binding on all alike (449); the recognition of the right of intermarriage between patricians and plebeians by the *lex Canuleia* (445); the successive opening up of the high offices to the plebeians; the Licinian Rogations (q.v., 367); and the agrarian agitation of Tiberius and Gaius Gracchus. (See Agrarian Laws; Gracchus.) Augustus Cæsar took to himself the power and rights of the tribunes (*tribunicia potestas*), and hence under the Empire the office lost its importance, becoming a function for senators of plebeian rank, held between the quæstorship and the prætorship. Consult the article "Tribunus" in W. Smith, *A Dictionary of Greek and Roman Antiquities,* vol. ii (3d ed., London, 1891); A. H. J. Greenidge, *Roman Public Life* (ib., 1901); J. E. Granrud, *Roman Constitutional History* (Boston, 1902); G. W. Botsford, *The Roman Assemblies* (New York, 1909); F. F. Abbott, *A History and Description of Roman Political Institutions* (3d ed., Boston, 1911).

TRIBUNE. In architecture, a place or structure from which to address an audience; a use of the term derived from the Roman provisions for the promulgation of decrees of the tribunes or magistrates. The term is variously applied to (*a*) the apse of a church; (*b*) any pulpit or platform, civil or ecclesiastical, and especially the platform and desk from which alone, in the French Senate or Chamber of Deputies, the legislator is allowed to address the chamber; (*c*) a balcony or gallery in a church or hall, for musicians, as, e.g., those once in the cathedral of Florence (now in the Opera del Duomo), sculptured by Donatello and Luca della Robbia with exquisite figures of children singing and playing on instruments.

TRIBUT DE ZAMORA, trē̆′bụ′ de *zȧ′mō′rȧ′,* Le. An opera by Gounod (q.v.), first produced in Paris, April 1, 1881; in the United States, Jan. 12, 1888 (New Orleans).

TRIB′UTE (Lat. *tributum,* from *tribuere,* to grant, pay, or assign, originally to a tribe, from *tribus,* a tribe). Money, commodities of value, or services rendered by one ruler or state to another in token of submission, as distinguished from taxation, which is the legal imposition of financial burdens by a state upon its own subjects. This distinction cannot be said, however, always to have prevailed, and, under the feudal system especially, taxation, tribute, and rent were in many cases identical. This was natural under a system where the political superior was at the same time the owner of the land, and where such land was held largely by military tenure. Aids and reliefs were essentially of the nature of tribute, as also were the tolls and services levied upon the cultivators of the soil by their lords, or exactions like that of heriot (q.v.). See Feudalism.

TRICAR. See Cycle Car; Side Car.

TRICER′ATOPS (Neo-Lat., from Gk. *τρεῖς, treis,* three + *κέρας, keras,* horn + *ὤψ, ōps,* face). An interesting fossil reptile, a horned dinosaur of formidable aspect, of which skeletons are found in the Upper Cretaceous rocks of Colorado, Dakota, Wyoming, and Montana. The animal was about 25 feet long, with heavily built legs and powerful tail. The most peculiar feature is the strong armature of the massive head. The skull is larger than that of any other known land animal, with a length of 6 feet and a width across the crest of about 5 feet. It is wedge-shaped and narrow in front of the small orbits and expanded behind into a broad solid bony crest which projects far backward over the neck and shoulders, with edges armed with a row of sharp projections that were covered by horn. On the facial region are three horns: a long outward spreading pair over the orbits and a small horn on the nose. The jaws have strong turtle-like beaks on their tips and series of two-rooted teeth placed in sockets in their posterior portions. The brain of this creature was smaller than that of any other known vertebrate, with a ratio to bulk of body of two pounds to 10 tons. The feet were three-toed, and the beast walked on all fours and fed on plants. Consult: Zittel and Eastman, *Textbook of Palæontology*, vol. ii (London and New York, 1902); Marsh, "The Dinosaurs of North America," in *Annual Reports of the United States Geological Survey*, vol. xvi, part i (Washington, 1896); Lucas, *Animals of the Past* (New York, 1914), which contains interesting observations on the habits of *Triceratops*. See Dinosauria, and Plate of Dinosaurs.

TRICHECHIDÆ, trĭ-kĕk'ĭ-dē. See Carnivora; Pinnipedia.

TRICHIASIS, trĭ-kī'ȧ-sĭs (Neo-Lat., from Gk. *τριχίασις*, from *θρίξ*, *thrix*, *τριχός*, *trichos*, hair). An inversion of one or more eyelashes, their points rubbing against the globe of the eye. It results from cicatricial contraction or long-continued inflammation of the eyelids. The symptoms, like those of entropion (q.v.), are caused by irritation of the conjunctiva by the rubbing of the eyelashes. The treatment consists in plucking out the offending hairs (if they are few in number) from time to time. Electrolysis may be employed. In other cases it may be necessary to perform a plastic surgical operation on the lid.

TRICHINA, trĭ-kī'nȧ (Neo-Lat., from Gk. *θρίξ*, *thrix*, hair). A peculiar nematode worm, which in its sexually immature state inhabits the muscles of mammals, usually the pig. It was discovered in 1835.

The young trichinæ, as seen in human muscle, present the form of spirally coiled worms, in the interior of small, globular, oval, or lemon-shaped cysts, which appear as minute specks scarcely visible to the naked eye. The cysts are sometimes altogether absent and hence must be regarded as formations resulting from local inflammation set up by the presence of the worm, which in this larval condition measures about a millimeter long. These larval worms exhibit a well-marked digestive apparatus and afford evidence of the presence of reproductive organs, which are often sufficiently developed to enable the observer to determine the sex. The number of larval trichinæ that may simultaneously exist in the muscles of a single man or animal is enormous.

When an animal is fed with flesh containing the larval worm and is killed a few days afterward, a large number of minute worms are found in the contents of the small intestines. On the second day after their introduction these intestinal trichinæ attain full sexual maturity, and in six days the females contain perfectly developed and free embryos.

The female is a slender round worm, varying in length from $\frac{1}{18}$ to $\frac{1}{8}$ of an inch. The anterior end presents a beadlike appearance, from which the intestinal canal proceeds. The posterior three-fourths are mainly occupied by the reproductive organ, which is filled partly with free embryos and partly with eggs in various stages of maturity. The females continue bringing forth young for two or three weeks. The embryos penetrate the walls of the intestine and pass either through the body cavity or by means of the blood vessels into the muscles of the host, where, if conditions are favorable, they are developed into the encysted form. Some of them reach the muscles of the extremities and other distant parts; but the majority remain in those sheathed muscular groups which are the nearest to the cavity of the body (abdomen and thorax), especially in those which are smaller and most supplied with connective tissue. These embryos penetrate the interior of the separate muscle fibres, and in 14 days acquire the size and organization of *Trichina spiralis*. In the adult condition trichinæ perish in cold water in about an hour and cannot survive the decease of their host for more than six hours, but the larvæ remain alive in water for a month and will live for a long time in flesh which has become putrid. In this way a carcass near a marsh or rivulet may communicate the parasites to the ruminants that drink the water or to pigs. The formation of the cysts is the cause of more or less serious injury to the host, according to the number present. When abundant, the weakness is very marked and is often fatal. In man infection occurs almost invariably through the eating of raw or underdone pork containing the cysts. If the meat is properly cooked the worms will be destroyed. Consult Max Braun, *Die thierischen Parasiten des Menschen* (3d ed., Würzburg, 1903). See Parasite, Animal.

TRICHINIASIS, trĭk'ĭ-nī'ȧ-sĭs, or **TRICHINOSIS**, -nō'sĭs (Neo-Lat., from *trichina*, trichina). A disease caused by the ingestion of meat (pork or sausage) containing trichina (q.v.), characterized by a number of diverse symptoms. In 1831 Hilton Warmald first noted the characteristic specks while dissecting; but the trichina was demonstrated by Paget and the naturalist Sir Richard Owen in 1835. Zenker first demonstrated, in 1860, that trichiniasis caused death, and Virchow (q.v.) first propagated the nematode in an animal and demonstrated its presence in the intestine in 1859. Leuckart in the following year presented a full, lucid, and complete solution of the whole question. After being swallowed, the trichina worms traverse the connective tissue and gain access to all parts of the body. They are found in the muscles of the trunk and head as well as in the extremities, and thickly placed in the diaphragm, the intercostals, the muscles of the neck and of the eyes. The intestinal canal shows catarrhal changes, and the trichina may be found in the intestinal mucosa. The mesenteric glands are swollen. The heart muscle is almost invariably free from invasion.

The parasite occurs in two forms—one, a sexually mature form (intestinal trichina), the other an immature form (muscle trichina). The intestinal worm is small and hairlike, the male being $\frac{1}{18}$ of an inch long, the female $\frac{1}{8}$ of an inch long. Muscle trichina develops its sexual apparatus after invading the intestinal canal, and the embryos at once migrate from the intestines to the muscular system of the victim, where they set up an inflammatory reaction and become encapsulated in a fibrous envelope, where they lie coiled. Lime salts are gradually deposited about the capsule and in the parasite itself. Development is very rapid; within two days after infected pork enters the digestive tract the muscle larvæ mature; embryos are born six days later, and in about two weeks migration to the muscle is completed. The mortality of trichiniasis varies between 20 and 50 per cent.

The early symptoms of the disease are nausea, vomiting, colic, and diarrhœa. The muscles become weak, and great weariness is experienced. Between the tenth day and the sixth week the muscles become stiff and tender. This condition is most noticeable in the flexors of the extremities, and occasionally the knees or elbows will be bent and rigid. Œdema is characteristic and appears about the seventh day, first in the eyelids and the face, next in the extremities, and is probably due to toxins excreted by the parasites. Profuse sweating is characteristic; insomnia is a common symptom together with headache. In the blood the eosinophile cells are greatly increased. Swine suffer principally, among the lower animals; but rats, mice, rabbits, and guinea pigs are easily infected. Horses, cattle, sheep, goats, and dogs are infected less readily. It has been stated that rats carry the parasites to swine. Cats are occasionally victims of trichiniasis.

It is supposed that the parasite gained access into Europe through the introduction of the Chinese pig early in the nineteenth century. The disease was epidemic in Syria in 1881 and has appeared in Algiers, in South America, in the West and Massachusetts in the United States, in France, in Basel, Switzerland, in Malaga, Spain, in Russia, Sweden, Norway, and Denmark, in England in 1871, in North Germany since 1849, an epidemic occurring in Hettstedt in 1863.

Prophylaxis consists in the careful inspection of swine, after slaughtering, by competent microscopists, who take sections from the muscles of mastication, the laryngeal and abdominal muscles, and the diaphragm. There is no treatment for the disease, and in all probability many nonfatal cases occur which are diagnosed as rheumatism or some acute fever, as well as some cases of pneumonia in which the trichina parasite is the unidentified cause. Consult an article by C. W. Stiles, in William Osler, *Modern Medicine* (New York, 1914).

TRICHINOPOLI, trĭch'ĭ-nŏp'ō-lĭ. The capital of a district of Madras, British India, on the right bank of the Kaveri, below the island of Srirangam (q.v.), 56 miles from the sea and 190 miles by rail southwest of Madras (Map: India, C 7). The old town, now inclosed by boulevards, stands at the base and on the rugged slope of a granite rock, 273 feet high, crowned by a temple, a much-frequented pilgrimage shrine. The native town is inhabited by a dense population dwelling in low, closely packed huts. The chief building is the former Nawab's palace, now restored and used as government offices. There are several Protestant missions and a college and also a Jesuit college and a fine Roman Catholic cathedral. Beyond the boulevards is St. John's Anglican Church, containing the tomb of Bishop Heber, who died here in 1826; to the south near Golden Rock, a hill about 100 feet high, is the central jail, one of the largest buildings of its kind in Madras. Cheroots are manufactured in large quantities from excellent tobacco grown in the vicinity. Weaving and the manufacture of hardware, cutlery, jewelry, gold chains, harness, and saddlery are extensively carried on. Trichinopoli was governed by a line of rajahs that died out in 1732 when it came under the rule of the Nawab of Arcot. It came under British control in 1801 with the rest of the region. Pop., 1901, 104,-721; 1911, 123,512.

TRICHINOSIS, trĭk'ĭ-nō'sĭs. See Trichiniasis.

TRICHLO'ROMETH'ANE. See Chloroform.

TRICHOGYNE, trĭk'ō-jĭn (from Gk. *θρίξ*, *thrix*, hair + *γυνή*, *gynē*, woman, female). One of the cells of the female organ (procarp) of the red algæ (see Algæ), appearing as a hairlike extension of the female cell. Against it the male cells lodge, and into it they discharge their contents, which pass into the female cell.

TRI'CHOME (from Gk. *τρίχωμα*, *trichōma*, growth of hair, from *τριχοῦν*, *trichoun*, to furnish with hair, from *θρίξ*, *thrix*, hair). A hairlike outgrowth from the epidermis of plants, usually arising from a single cell. These structures are known variously as hairs, glands, bristles, bladders, scales, prickles, warts, etc., and may be one or many celled. The long hairs on the seeds of cotton are simple and unicellular. The filaments on the stamens of the spider lily (*Tradescantia*) are multicellular and simple. Branched unicellular hairs may be found on the common shepherd's purse (*Capsella*) and branched multicellular hairs on mullein. Hairs with flattened expansions at the top are called scales. Glandular hairs are widely distributed among plants, being usually unbranched and with a knob at the apex, which secretes such substances as resins, gums, ethereal oils, mucilage, and sugar. When the substance is secreted in a liquid form it moistens the surface, but when volatile it is recognized as an odor. Root hairs are hairlike outgrowths from the epidermal cells of the root. They greatly increase the surface of exposure for the intake of soil water. Many plants and organs which bear hairs during early stages of development become smooth as they grow older. Environment also affects the hairiness of a structure. A plant growing in a very dry situation may be hairy, while another individual of the same species growing in a wet situation may be much less hairy or even entirely smooth. Systematists have made large use of the trichome in describing plants and have developed a large number of descriptive terms.

TRICHOPTERA, trī-kŏp'te-rȧ (Neo-Lat. nom. pl., from Gk. *θρίξ*, *thrix*, *τριχ-*, *trich-*, hair + *πτερόν*, *pteron*, wing). An order of insects containing the caddis fly (q.v.).

TRI'CHROISM. See Dichroism.

TRICLIN'IC SYSTEM. See Crystallography and Plate of Crystal Forms.

TRICLINUS, Demetrius. See Demetrius Triclinus.

TRI'COL'OR (Fr. *tricolor*, from Lat. *tres*, three + *color*, color). Literally a flag in three colors, which is the case in almost every national ensign, but usually restricted in sense to flags having three colors in equal masses. The principal tricolor ensigns are those of France—blue, white, and red, divided vertically; Germany—black, white, and red, divided horizontally; Russia—white, blue, and red, divided horizontally; Italy—green, white, and red; Belgium—black, yellow, and red; and Mexico—green, white, and red; the last three all divided vertically. The French tricolor took its use at the outbreak of the revolution of 1789, as the badge of the National Guard. The red and blue were selected as the arms of Paris, and the white was added as the color of the army, to show the intimate union which should subsist between the people and the national defenders.

TRICTRAC. A variety of backgammon (q.v.).

TRI′DENT (Lat. *tridens*, three-toothed, from *tres*, three + *dens*, tooth). In classic mythology, the attribute of Poseidon (see Neptune), god of the sea. It consists of a staff, armed at one end with three short prongs, with double barbs at the points.

TRIDOLIN, trē′dō′lăn′. See Fridolin.

TRID′YMITE (from Gk. *τρίδυμος*, *tridymos*, threefold, from *τρεῖς*, *treis*, three; so called from its frequent crystallization in groups of three). A mineral silicon dioxide crystallized in the hexagonal system. It resembles quartz, from which it differs, however, in having a lower specific gravity. It occurs chiefly in acidic volcanic rocks and was originally discovered in 1868 in the trachyte of San Cristóbal in Mexico. It has been prepared artificially by dissolving a silicate in a bead of phosphorus salt.

TRIEN′NIAL ACT. A British statute of the reign of William III (1694), directing that no Parliament should last longer than three years. This period was made seven years by the Septennial Act of George I (1716) and reduced to five in 1911. The session of the 1911–16 Parliament was extended, by a special bill, to Jan. 31, 1917.

TRIER, trēr. The German name for Treves.

TRIEST, trē-ĕst′, or **TRIESTE**. The principal seaport of Austria-Hungary, situated at the northeast extremity of the Adriatic Sea, on the Gulf of Triest, 367 miles by rail southwest of Vienna (Map: Austria, C 4). Triest and the adjoining district form an Austrian crownland, and the city is the general administrative seat of the Austrian Küstenland (q.v.). The city, which is strongly fortified, extends somewhat in the manner of an amphitheatre along the acclivity of the Karst (q.v.). The old town, with its narrow, crooked, and steep streets, lies at the base of the Castle Hill and between it and the gulf. In its northwestern corner, close to the water, is the Tergesteo, a huge edifice, whose cruciform arcades, roofed with glass, are used for the exchange and for various shops and offices. Near by are the two leading squares, the Piazza della Borsa and the Piazza Grande. From this vicinity the Corso, the principal street, extends eastward, separating the old town from the new quarter, where broad avenues lead up towards the inclosing hills. On the west side of the Castle Hill, in the old town, the cathedral of San Giusto occupies a conspicuous site where a Roman temple once stood. It is a composite structure, dating from the fourteenth century. It was formed by joining three ecclesiastical edifices, which had stood there since the sixth century. On the Piazza Grande are the splendid new municipal buildings. Triest has a Museo Lapidario, an open-air museum of Roman antiquities, occupying a disused cemetery. The town has a nautical academy containing the municipal museum, with Roman antiquities, and the Ferdinand-Maximilian Museum, with its collection of Adriatic fauna.

Towards the southern end of the city is the Museo Civico Revoltella in the palace of that name. Near by stands the fine bronze monument to Maximilian of Mexico by Schilling. From this point leading south and following the curve of the gulf extends the Passeggio di Sant' Andrea, affording fine views for more than 3 miles, and reaching the vast wharves of the Lloyd Company. The public gardens are in the northeast of the city. Among the attractions of Triest is the famous château of Miramar, situated on the sea to the northwest, which belonged to Maximilian. It has a lovely park and offers beautiful sea views. The city contains a Greek church with rich decorations, a Jesuit church, and a Capuchin convent. There are a commercial academy, an astronomical and meteorological observatory, a public library with over 120,000 volumes, and museums of natural history and antiquities.

The harbor, the main attraction of Triest proper, has been greatly extended and improved. There are a number of moles and an immense breakwater. The Canal Grande (only 400 yards long) penetrates the city north of the Corso and permits vessels to load and unload at the warehouses. Triest has a naval arsenal and is the storehouse for the Austro-Hungarian navy. Triest has of late years found a rival in the Hungarian port of Fiume, but its commercial preëminence is vigorously supported by the Austrian government. In 1913 there were entered at the port 14,231 vessels, of 5,480,074 tons, and cleared 14,186, of 5,475,445 tons. There is a very large trade in grain, oil, wine, and many other products. The local mercantile fleet is large. At the Austrian Lloyd shops many vessels are annually constructed. Triest builds ships of all varieties and manufactures marine steam engines, cables, furniture, silks and cottons, clothing, liquors, wax lights, soap, etc.

Pop., 1910 (city), 160,993; crownland, 229,510. The crownland consists of the city and outlying territory; its total area is only 36.9 square miles. In the crownland the percentage of persons whose vernacular was Italian was 62.3; Slovene, 29.8; German, 6.2. Of the inhabitants of the crownland, 94.9 per cent were returned as Roman Catholic, 2.4 Jewish, and 1.1 Evangelical.

History. Triest is the Roman Tergeste. Since 1382 it has been a part of Austria, except in 1797–1805 and 1809–13. It was made a free port in 1719 by Charles VI, which date marks the beginning of its importance. It finally became the commercial rival of Venice. With its territory it was constituted a separate crownland in 1867. Triest was the objective of an Italian campaign in the great war. It was attacked by aërial forces several times. See War in Europe. Consult: J. Löwenthal, *Geschichte der Stadt Triest* (Triest, 1857–59); Scussa, *Storia cronografica di Trieste* (new ed., ib., 1885–86); F. H. Jackson, *Shores of the Adriatic: The Austrian Side* (New York, 1908).

TRIFAIL, trē′fĭl. A town in Styria, Austria, on a tributary of the Save, 66 miles southwest of Marburg. Trifail has one of the most productive mines of lignite in Austria. There are large cement, chemical, and glass works. Pop., 1900, 10,851; 1910, 11,578.

TRIFO′LIUM. See Clover.

TRIFO′RIUM (ML., from Lat. *tres*, three + *foris*, door, opening), or Triforium Gallery. The arcade opened up in the wall of the nave of a mediæval church immediately above the pier arches and under the clearstory windows. The name was derived from the custom of dividing each bay of this gallery into three arches, though this was by no means the constant rule, early galleries having often a single arch and later ones having two, four, or more arches in each bay. The triforium, whose origin is probably the open gallery above the side aisle in Byzantine and Romanesque churches, was in many Gothic churches inserted between the summit of the aisle vault and the top of its slanting roof, though in developed Gothic the roof line was often changed so as to let light into the gallery. The earlier churches had higher galleries, especially in English Norman churches; but during the thirteenth century the French Gothic builders diminished their size and usefulness, retaining them mainly for decorative purposes and as blind or semiblind galleries, not intended to be used by the congregation.

TRIGGER FISH. One of the fishes of the plectognath family Balistidæ, characterized by an ovate body covered with large rough scales, and the fact that the first spine of the anterior of the two dorsal fins is high and strong and may be lifted, when it is locked erect by the spine behind it; whence the name. About 50 species are known, mainly in Indo-Pacific regions, where they become rather large and remain near shore; some are herbivorous, others carnivorous. Their flesh is rarely eaten, as it is reputed poisonous. Several species of the genus *Balistes* inhabit the American tropics, of which one, the cicuyo, or leather jacket (*Balistes carolinensis*), is common in the Gulf of Mexico and on the South Atlantic coast, and also in the Mediterranean. See Plate of PLECTOGNATH FISHES.

TRI′GLYPH (Lat. *triglyphus*, from Gk. *τρίγλυφος*, three grooved, from *τρεῖς*, *treis*, three + *γλύφειν*, *glyphein*, to carve). In the Doric frieze, the projecting block between the metopes (q.v.). It is supposed to represent the ends of the beams in the original structure of wood and crude brick. Its face regularly contains two triangular vertical furrows, and the edges are chamfered. Consult Allan Marquand, *Greek Architecture* (New York, 1909).

TRIG′ONAL SYSTEM. See CRYSTALLOGRAPHY and Plate of CRYSTAL FORMS.

TRIG′ONEL′LINE. See ALKALOIDS.

TRIGO′NIA (Neo-Lat. nom. pl., from Gk. *τρίγωνος*, *trigōnos*, triangular, from *τρεῖς*, *treis*, three + *γωνία*, *gōnia*, angle). This genus, represented at the present time by only five species living in the Australian seas, was one of the most important types of lamellibranchs in the Mesozoic seas of Europe. *Trigonia* appeared first in the Liassic, became very abundant in the Middle and Upper Jura and the Middle Cretaceous, and then in the Tertiary declined in number of species to the present time. The Mesozoic species, some of which are four or five times the size of the living species, are arranged into groups according to the markings of their shells, which are often elaborately sculptured. Consult Louis Agassiz, *Etudes critiques sur les mollusques fossiles: Mémoire sur les trigonies* (Neuchâtel, 1840), and John Lycett, "A Monograph of the British Fossil Trigonias," in *Palæontographical Society Monographs* (London, 1872–79).

TRIG′ONOCAR′PUS (Neo-Lat., from Gk. *τρίγωνος*, *trigōnos*, triangular + *καρπός*, *karpos*, fruit). Fossil seed pods and fruits, probably of various kinds of plants, which in cross section have a triangular form. See CARPOLITH; CONIFERÆ; CORDAITES; PALEOBOTANY.

TRIG′ONOMET′RIC SERIES. See SERIES.

TRIG′ONOM′ETRY (from Gk. *τρίγωνον*, *trigōnon*, triangle, from *τρεῖς*, *treis*, three + *γωνία*, *gōnia*, angle + *-μετρία*, *-metria*, measurement, from *μέτρον*, *metron*, measure, from *μετρεῖν*, *metrein*, to measure). Originally the study of triangles, especially the theory of the measurement of their sides, angles, and areas; now the measure of triangles is merely a part of the general subject. That portion of the subject which deals with the measurement of figures in a plane is called plane trigonometry, and that which deals with figures on the surface of a sphere is called spherical trigonometry. That branch of the subject which deals with the circular functions of angles is called goniometry. The pure theory of trigonometric functions, apart from their application to problems of measurement, is called analytic trigonometry. Elementary trigonometry has many useful applications, as in the measurement of areas, heights, and distances. It is indispensable to the study of astronomy, physics, and the various branches of engineering.

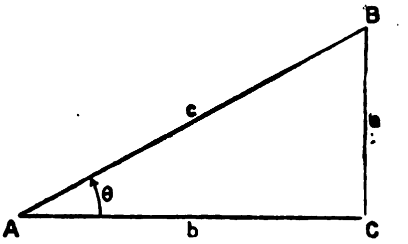


FIG. 1.

The common functions of trigonometry may be defined as ratios of certain sides of a right triangle. Thus, in the figure, the ratio $\frac{a}{c}$ is called the *sine* of the angle θ, commonly written $\sin\theta = \frac{a}{c}$. The ratio $\frac{b}{c}$ is called the *cosine* of the angle θ, written $\cos\theta = \frac{b}{c}$. The other functions are *tangent* of θ, symbolically written $\tan\theta = \frac{a}{b}$; *cotangent* of θ, or $\cot\theta = \frac{b}{a}$; *secant* of θ, or $\sec\theta = \frac{c}{b}$; and *cosecant* of θ or $\csc\theta$ ($\operatorname{cosec}\theta$) $= \frac{c}{a}$. There are also used the functions *versine* of θ, or $\operatorname{vers}\theta = 1 - \cos\theta = 1 - \frac{b}{c}$; and *coversine* of θ, or $\operatorname{covers}\theta = 1 - \sin\theta = 1 - \frac{a}{c}$. Of these functions, the most important are $\sin\theta$, $\cos\theta$, $\tan\theta$, and $\cot\theta$. These admit of easy manipulation by means of logarithms (q.v.). Since $\sec\theta = \frac{1}{\cos\theta}$ and $\csc\theta = \frac{1}{\sin\theta}$, and since it is as easy to find $\frac{1}{\cos\theta}$ and $\frac{1}{\sin\theta}$ by logarithms as to find $\cos\theta$ and $\sin\theta$, it is evident that $\sec\theta$ and $\csc\theta$ are of relatively little importance when logarithms are used. As to $\operatorname{vers}\theta$ and $\operatorname{covers}\theta$, they do not admit of easy treatment by logarithms, and so they, like $\sec\theta$ and $\csc\theta$, have been little used since the invention of these aids to computation. The propriety of calling these ratios functions of the angle θ consists in this, that the value of any ratio depends upon the value of θ. That is, in any right-angled triangle $AB'C'$, having an acute angle θ, the corresponding ratios $\frac{a'}{c'}, \frac{b'}{c'}, \frac{a'}{b'}$ (Fig. 2) are equal to the ratios $\frac{a}{c}, \frac{b}{c}, \frac{a}{b}$; and in any right-angled triangle in which the acute angle θ' is not equal to θ the corresponding ratios are not equal to those for θ.

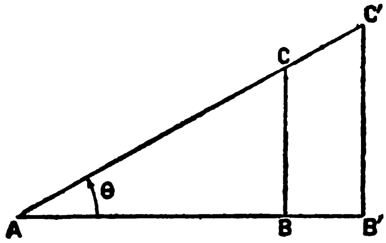


FIG. 2.

The trigonometric functions as defined by the above ratios are evidently limited to angles less than 90°, since a triangle contains but one right angle. However, the definition may be extended to angles of any size and the functions may be expressed by line segments.

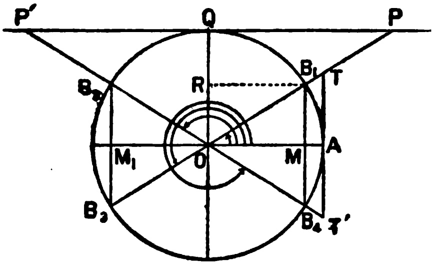


FIG. 3.

In Fig. 3 the radius $OA (= OB)$ may be regarded as the unit of length, hence the ratio $\frac{B_1M}{OB_2} = B_2M_1$ and $\sin AOB_1 = B_1M$. Similarly $\cos AOB_1 = OM$, $\tan AOB_1 = AT$, $\cot AOB_1 = PQ$, $\sec AOB_1 = OT$, $\csc AOB_1 = OP$, $\operatorname{vers} AOB_1 = MA$, and $\operatorname{covers} AOB_1 = QR$. If the angle is obtuse as AOB_2, or reflex as AOB_3, AOB_4, the functions are represented by the corresponding lines. For example, $\sin AOB_3 = B_3M_1$, $\tan AOB_4 = AT'$. The following convention of signs (see Fig. 4), however, serves to associate these values with the proper angle: Lines measured to the right of the vertical diameter, as OM, are called positive, and those to the left, as OM_1, negative; lines measured upward, as B_1M, from the horizontal diameter are called positive, and those downward, as M_4B_4, negative; the revolving radius OB is always positive. Thus (see Fig. 4), the signs of the functions of an angle not exceeding 90° are all plus. The versine and coversine are evidently always positive. The sine and cosecant are positive in the first and second quadrants and negative in the third and fourth. The cosine and the secant are positive in the first and fourth quadrants and negative in the second and third. The tangent and cotangent are positive in the first and third quadrants and negative in the second and fourth. We have, therefore, the following relations:

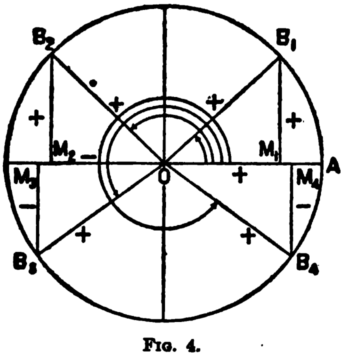


FIG. 4.

$$\begin{aligned} \sin(-\alpha) &= -\sin\alpha \\ \cos(-\alpha) &= \cos\alpha \\ \tan(-\alpha) &= -\tan\alpha \\ \cot(-\alpha) &= -\cot\alpha \end{aligned}$$

For the definition of a negative angle, see ANGLE.

A given value of a function does not, however, uniquely determine the angle, as will appear from the following table of relations:

FIRST QUADRANT

$$\begin{array}{l|l} \sin(90^\circ - \theta) = \cos\theta & \tan(90^\circ - \theta) = \cot\theta \\ \cos(90^\circ - \theta) = \sin\theta & \cot(90^\circ - \theta) = \tan\theta \end{array}$$

SECOND QUADRANT

$$\begin{array}{l|l} \sin(180^\circ - \theta) = \sin\theta & \sin(90^\circ + \theta) = \cos\theta \\ \cos(180^\circ - \theta) = -\cos\theta & \cos(90^\circ + \theta) = -\sin\theta \\ \tan(180^\circ - \theta) = -\tan\theta & \tan(90^\circ + \theta) = -\cot\theta \\ \cot(180^\circ - \theta) = -\cot\theta & \cot(90^\circ + \theta) = -\tan\theta \end{array}$$

THIRD QUADRANT

$$\begin{array}{l|l} \sin(180^\circ + \theta) = -\sin\theta & \sin(270^\circ - \theta) = -\cos\theta \\ \cos(180^\circ + \theta) = -\cos\theta & \cos(270^\circ - \theta) = -\sin\theta \\ \tan(180^\circ + \theta) = \tan\theta & \tan(270^\circ - \theta) = \cot\theta \\ \cot(180^\circ + \theta) = \cot\theta & \cot(270^\circ - \theta) = \tan\theta \end{array}$$

FOURTH QUADRANT

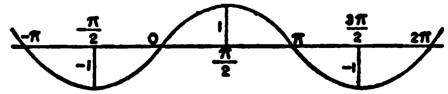
$$\begin{array}{l|l} \sin(360^\circ - \theta) = -\sin\theta & \sin(270^\circ + \theta) = -\cos\theta \\ \cos(360^\circ - \theta) = \cos\theta & \cos(270^\circ + \theta) = \sin\theta \\ \tan(360^\circ - \theta) = -\tan\theta & \tan(270^\circ + \theta) = -\cot\theta \\ \cot(360^\circ - \theta) = -\cot\theta & \cot(270^\circ + \theta) = -\tan\theta \end{array}$$

Thus, to express the trigonometric functions of angles greater than 90° in terms of those of angles less than 90°, determine first the sign of the function to be so expressed, next subtract from the angle whatever multiple of 90 is necessary to make it less than 90°. If an even multiple of 90° is subtracted the name of the original function is retained, but if an odd multiple is subtracted the original function is replaced by the conamed function. For example, to express $\cos(270^\circ - \theta)$ in terms of a function of θ. This angle is in the third quadrant and therefore its cosine is negative. To make the angle $270^\circ - \theta$ less than 90° we must subtract 180° and we have $\cos(270 - \theta) = -\cos(90^\circ - \theta)$. But $\cos(90^\circ - \theta) = \sin\theta$, and we have $\cos(270^\circ - \theta) = -\sin\theta$.

The increasing of an angle by 360° or any multiple of 360° does not alter the value of the trigonometric functions of that angle. (See FUNCTION.) It appears from the geometric representation of the functions that the values of the sines and cosines of all real angles lie within the interval + 1, − 1; the values of the tangents and cotangents of all real angles lie within the interval + ∞ and − ∞; those of the secants and cosecants without the interval + 1, − 1, as is shown in the following table:

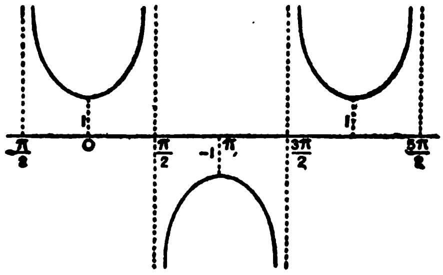
FUNCTION	0°	90°	180°	270°	360°
Sine	0	1	0	1	0
Cosecant	∞	1	− ∞	− 1	∞
Cosine	1	0	− 1	0	1
Secant	1	∞	− 1	− ∞	1
Tangent	0	∞	0	− ∞	0
Cotangent	∞	0	− ∞	0	∞

The variations of the functions are best exhibited by means of graphs. In the figures the arcs are laid off as abscissas and the functions as ordinates. See **Coördinates**.

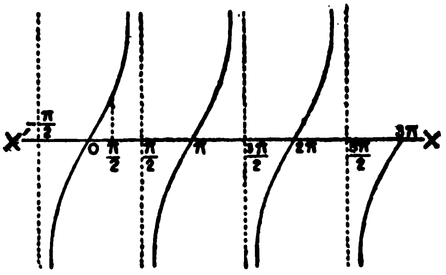


GRAPH OF SIN θ.

From the definition of the trigonometric functions, it is evident that they bear certain relations one to another. Some of the fundamental ones are, $\sin^2\theta + \cos^2\theta = 1$, $\sin\theta \csc\theta = 1$, $\cos\theta \sec\theta = 1$, $\tan\theta \cot\theta = 1$, $\tan = \sin\theta/\cos\theta$, $1 + \tan^2\theta = \sec^2\theta$, $1 + \cot^2\theta = \csc^2\theta$, from which many others readily follow. Besides these relations existing between the functions of a single angle, there are those connecting the functions of several angles. Thus,



GRAPH OF SEC θ.



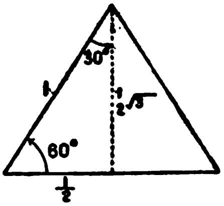
GRAPH OF TAN θ.

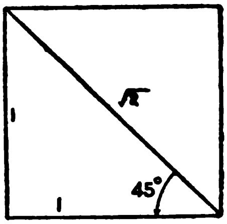
$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B,$$
$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B,$$
$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B},$$
$$\cot(A \pm B) = \frac{\cot A \cot B \mp 1}{\cot A \pm \cot B};$$

and $\sin 2A = 2 \sin A \cos A$, $\cos 2A = \cos^2 A - \sin^2 A$, $\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$, and $\cot 2A = \frac{\cot^2 A - 1}{2 \cot A}$, which are easily derived from the corresponding formulas for $A + B$ by putting $A = B$. Some of the formulas for functions of half an angle are: $\sin\frac{1}{2}A = \pm\sqrt{\frac{1 - \cos A}{2}}$, $\cos\frac{1}{2}A = \pm\sqrt{\frac{1 + \cos A}{2}}$, $\tan\frac{1}{2}A = \pm\sqrt{\frac{1 - \cos A}{1 + \cos A}}$, and $\cot\frac{1}{2}A = \pm\sqrt{\frac{1 + \cos A}{1 - \cos A}}$. By reapplying these formulas it is evident that functions of $3A$, $4A, \ldots . nA$ may be expressed as functions of A and also as functions of various fractional parts of A.

To every function there is an inverse function or antifunction, just as to every logarithm there is an antilogarithm. The formula to express the angle whose sine is x is $\sin^{-1} x = \theta$, read "θ is the angle whose sine is x." In most European countries this is indicated by the symbol arc $\sin x = \theta$, read "θ is the arc (angle) whose sine is x," or merely "arc sine x is equal to θ." Similarly $\tan^{-1} y = \theta$ is read, "θ is the angle whose tangent is y," or antitangent of y equals θ, and this is also written arc $\tan x = \theta$. All inverse functions admit of translation into the direct formulas. Thus, $\sin^{-1} x = \theta$ reduces to $\sin\theta = x$, and $\tan^{-1} = y = \theta$ to $\tan\theta = y$. All inverse or antifunctions can be expressed in series, as in the case of the functions. (See **Series**.) The following will serve as examples: $\sin^{-1} x =$

$$\mathrm{sin}b^1 x = \frac{x}{1} + \frac{1}{2}\cdot\frac{x^3}{3} + \frac{1\cdot 3}{2\cdot 4}\cdot\frac{x^5}{5} + \ldots . + \frac{1\cdot 3 \ldots . (2n-1)}{2\cdot 4 \ldots . 2n} \frac{x^{2n+1}}{2n+1} + \ldots . \tan^{-1} x = \frac{x}{1} - \frac{x^3}{3} + \frac{x^5}{5} - \ldots .$$
$$+ (-1)^n \frac{x^{2n-1}}{2n-1} + \ldots .$$

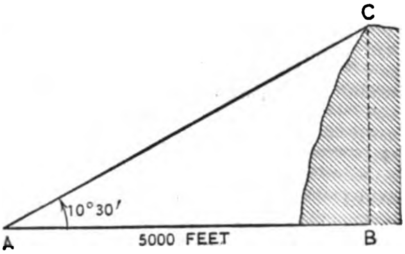




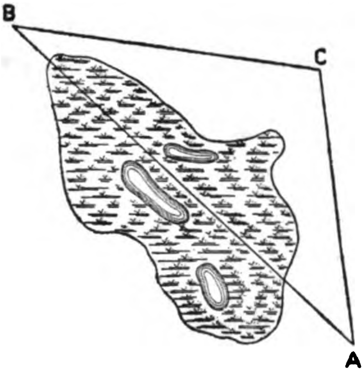
The values of the functions of certain angles may be calculated by reference to geometric figures, but the tables of such values for all angles have been calculated to a close degree of approximation by means of the trigonometric series. The equilateral triangle serves to exhibit the values of the functions of 60° and 30°. If the side is taken as 1, the figure shows that $\sin 60° = \frac{1}{2}\sqrt{3}$, $\cos 60° = \frac{1}{2}$, $\tan 60° = \sqrt{3}$, and so on. Similarly the functions of 45°, as $\sin 45° = \cos 45° = \frac{1}{\sqrt{2}} = \frac{1}{2}\sqrt{2}$, may be obtained from the square.

The following problems will serve to illustrate the use of trigonometry in practical mensuration: (1) Required the height of a hill above the horizontal plane of an observer, the distance of the observer from the point below the summit being 5000 feet and the angle of elevation 10° 30′. The height of the hill, represented by BC in the figure, is given by the equation $BC = \tan 10° 30'$

5000 feet = 0.1853 × 5000 feet = 926.5 feet, tan 10° 30′ being taken from a table of natural tangents. (2) Required the distance between



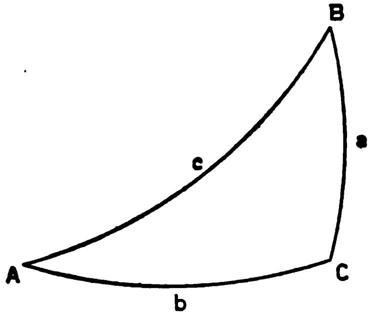
two points A and B separated by an impassable swamp, the line AC, as represented in the figure, being 15 chain lengths, the angle A 40° 15′, and



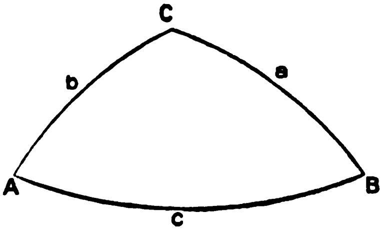
the angle C 110° 32′. The length of the line AB is given by the equation $AB = \dfrac{AC \sin 110° \, 32'}{\sin 150° \, 47'} = \dfrac{15 \cdot 0.9365}{0.4881} = 28.5$, the sines of the angles being taken from a table of natural sines. Therefore AB is 28.5 chain lengths.

From the expressions of e^x, $\sin x$, $\cos x$ (see SERIES), it follows that $e^{ix} = \cos x + i \sin x$ (see COMPLEX NUMBER), and that $e^{-ix} = \cos x - i \sin$; whence by adding and subtracting, $\cos x = \dfrac{e^{ix} + e^{-ix}}{2}$, $\sin x = \dfrac{e^{ix} - e^{-ix}}{2i}$. Similarly the other functions may be expressed in terms of e^{ix}, e^{-ix}. These are the exponential expressions for the circular functions of x. If i is omitted from these exponentials, the resulting functions are called the hyperbolic cosine, hyperbolic sine of the angle x. Hyperbolic functions are so called because they have geometric relations with the equilateral hyperbola analogous to those between the circular functions and the circle. The common notation for such functions is $\sinh \theta$, $\cosh \theta$, $\tanh \theta$, corresponding to the circular function $\sin \theta$, $\cos \theta$, $\tan \theta$. The values of these functions have been tabulated and are of service in analytic trigonometry.

The spherical triangle, like the plane triangle, has six elements, the three sides a, b, c, and the angles A, B, C. But the three sides of the spherical triangle are angular as well as linear magnitudes. The triangle is completely determined when any three of its six elements are given, since there exist relations between the given and the sought parts by means of which the latter may be found. In the right-angled or quadrantal triangle, however, as in the case of the right-angled plane triangle, only two elements are necessary to determine the remaining parts. Thus, given c, A, in the right-angled



triangle, ABC, the remaining parts are given by the formulas $\sin a = \sin c, \sin A$, $\tan b = \tan c, \cos A$, $\cot B = \cos c, \tan A$. The corresponding formulas when any other two parts are given may be obtained by Napier's rules concerning the relations of the five circular parts (q.v.), viz., a, b, complement of A, complement of B, complement of c. In the case of oblique triangles no simple rules have been



found, but each case is dependent upon the appropriate formula. Thus in the oblique triangle ABC, given a, b, and A, the formulas for the remaining parts are $\sin B = \dfrac{\sin A \sin b}{\sin a}$,

$$\tan \tfrac{1}{2} c = \tan \tfrac{1}{2}(a - b) \cdot \frac{\sin \frac{1}{2}(A + B)}{\sin \frac{1}{2}(A - B)},$$

$$\cot \tfrac{1}{2} C = \tan \tfrac{1}{2}(A - B) \cdot \frac{\sin (a + b)}{\sin (a - b)}.$$

It is evident in spherical trigonometry, as well as in plane, that three elements taken at random may not satisfy the conditions for a triangle, or they may satisfy the conditions for more than one. The treatment of the ambiguous cases in spherical trigonometry is quite formidable, since every line intersects every other line in two points and multiplies the cases to be considered. The measurement of spherical polygons may be made to depend upon that of the triangle. For if, by drawing diagonals, the polygons can be divided into triangles each of which contains three known or obtainable elements, then all the parts of the polygon can be determined. Since the elements of the spherical polygon measure the elements of the polyhedral angle whose vertex is at the centre of the sphere, the formulas of spherical trigonometry apply to problems involving the relations of the parts of such figures. For example, given two face angles and the included dihedral angle of a trihedral angle, the remaining face and dihedral angle may be determined by the same formulas as apply to the corresponding case of the spherical triangle. By aid of the formulas of spherical trigonometry the theories of transversals, coaxal circles, poles and polars, may be developed for the figures of the sphere. Spherical trigonometry is of great importance also in the theory of power circles, stereographic projection, and geodesy. It is also the basis of the chief calculations of astronomy; e.g., the solution of the so-called astronomical triangle is involved in finding the latitude and longitude of a place, the time of day, the azimuth of a star, and various other data.

Some traces of trigonometry exist in the earliest-known writings on mathematics. In the Papyrus of Ahmes (see AHMES) a ratio is mentioned called a *seqt*, and because of its relation to the methods of measuring the pyramids, this ratio seems to correspond to the cosine or the tangent of an angle. But to the Greeks are due the first scientific trigonometric investigations. The sexagesimal division of the circle was imperfectly known to the Babylonians, but Hipparchus was the first to complete a table of chords. Heron (q.v.) computed the values of $\cot\frac{2\pi}{n}$, for $n = 3, 4, \ldots . 11, 12$, and calculated the areas of regular polygons. Thirteen books of Ptolemy's *Almagest* were given to trigonometry and astronomy. The Hindus, beginning with Aryabhatta (q.v.) and including Brahmagupta and Bhaskara (qq.v.), contributed an important advance by introducing the half chord for the whole chord as used in the Greek calculations. They were familiar with the sine and calculated ratios corresponding to the versine and cosine. The sine, however, first appears with a special name (*jaib*) in the works of the Arab Al Battani (q.v.), and to his influence is due the final substitution of the half for the whole chord. Al Battani knew the theory of the right-angled triangle and gave the relation $\cos a = \cos b \cos c + \sin b \sin c \cos A$ for the spherical triangle. With another Arab writer, Abul Wefa (940–998), begins the first systematic arrangement of the theorems and proofs of trigonometry, the use of the unit radius, and the use of the secant. Nasir Eddin (born 1201) wrote the first work in which plane and spherical trigonometry appears as a science by itself, distinct from astronomy. The celebrated astronomer Jabir ibn Aflah, or Geber, eleventh century, wrote a work confined chiefly to spherical trigonometry and rigorous in its proofs, which was translated into Latin by Gherardo of Cremona. Regiomontanus (1436–76) wrote a complete plane and spherical trigonometry, the *De triangulis Omnimodis Libri quinque* (first printed at Nuremberg in 1533), a work which had very great influence upon the study of the subject. Vieta (1540–1603) made an important advance by the introduction of the idea of the reciprocal spherical triangle. Rhæticus (1514–76) made a great advance by considering the functions as ratios instead of lines. To Napier are due the formulas since called the analogies. Gunter introduced the term "cosine," and Finck (1583) introduced "secant" and "tangent." Growing out of the desire to construct more accurate tables and to simplify the methods of calculation for astronomical purposes, there was evolved by Napier and Bürgi or Byrgius (q.v.) the idea of the logarithm (q.v.). To Euler much is due for simplifying and classifying the treatment of the whole subject. Lagrange, Legendre, Carnot, Gauss, and others expanded the theory of polygonometry and polyhedrometry. The nineteenth century has contributed the so-called projective formulas and made further generalization of formulas known before.

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TRII'ODOMETH'ANE. See IODOFORM.

TRIISODON, trī'ī'sō-dŏn (Neo-Lat., from Gk. *τρεῖς*, *treis*, three, + *ἴσος*, *isos*, equal, + *ὀδούς*, *odous*, tooth). A fossil creodont mammal from the Puerco beds of New Mexico. The skull is the oldest known mammalian skull. Consult Matthew, "Additional Observations on the Creodonta," in *Bulletin of American Museum of Natural History*, vol. xiv (New York, 1901). See CREODONTA; MAMMALIA.

TRIKALA, trē-kä'lȧ, or **TRIKKALA.** A town of Greece, capital of the Nomarchy of Trikala, situated in the valley of the Peneus, on the Trikkalinos River, 37 miles west of Larissa and on the Volos-Kalabaka Railway (Map: Greece, C 4). It manufactures cotton, woolen stuffs, leather, and dye products. Pop., 18,000. Trikala is the Homeric Trikka, which was celebrated for its temple of Æsculapius.

TRIKOUPIS, trē-kōō'pis, CHARILAOS (1832–96). A Greek statesman, son of Spiridon Trikoupis, born at Nauplia. He studied jurisprudence in Athens and Paris and in 1852 entered the diplomatic service as attaché to the Legation at London, where in 1863 he became chargé d'affaires. In 1865 he conducted the negotiations with Great Britain regarding the cession of the Ionian Islands. Elected to the Boulé in the same year, he became an adherent of the radical party, was in 1866 appointed Minister of Foreign Affairs, became Premier in 1875, was once more Minister of Foreign Affairs under Canaris, in the coalition ministry of 1877, and Premier again in 1880, 1882–85, 1886–90, 1891–93, and 1893–95, when, owing to the financial embarrassment of the government, he met with a crushing defeat, losing even the seat in the Boulé which he had held for 30 years. While on his deathbed he was reelected by the District of Valtos. He died at Cannes, France, April 11, 1896. A volume of his speeches, *Λόγοι πολιτικοί*, appeared at Athens in 1888. Consult Tsokapoulos, *Βιογραφία Χαριλάου Τρικούπη* (Athens, 1896).

TRIKOUPIS, SPIRIDON (1788–1873). A Greek author and statesman, born at Missolonghi. He studied in France and England, became secretary of the Earl of Guilford during his occupancy of the position of Governor of the Ionian Islands, and played an important part in the war for independence. After 1821 he was employed in administrative and diplomatic business, being a member of the provisional government in 1826 and of the National Convention at Trœzen in 1827. He was President of the Council and Minister of Foreign Affairs in 1832, was thrice sent to London (1835–38, 1841–43, and 1850–61) as Ambassador, was Minister of Foreign Affairs and of Public Instruction in 1843, Vice President of the Senate (1844–49), and Envoy Extraordinary to Paris (1850) on the occasion of the blockade of the ports of Greece by England. His funeral oration on his friend Lord Byron, delivered in the cathedral of Missolonghi just after the poet's death, was translated into many languages. Other orations, partly religious and partly political, were collected and published (Paris, 1836). His masterpiece is the history of the Greek revolution, *Ἱστορία τῆς Ἑλληνικῆς Ἐπαναστάσεως* (London, 1853–57).

TRIL'BY. 1. A romance by Charles Nodier (1822). 2. A novel by George du Maurier (1895), and its chief character, a beautiful artist's model. The novel was very popular.

TRILL (Fr. *triller*, It., ML. *trillare*, to trill, probably onomatopoetic). In music, an embellishment produced by the continued and rapid repetition of one note alternately with another, either a whole tone or semitone above it. Its sign is *tr* placed over or under the principal note. The trill was known and used at the end of the sixteenth century, but its name was added considerably later.

TRIL'LIUM (Neo-Lat., from Lat. *tres*, three, so called from the symmetrical arrangement of the three outer and three inner segments). A genus of about a dozen species of North American perennial herbs of the lily family, growing in moist and shady (not marshy) grounds from Maine to Florida. They have a naked stem, 4 to 15 inches high, terminated by three ovate, pointed, broad, beautifully netted-veined leaves. *Trillium grandiflorum*, also called wake-robin, is a pretty wild flower, growing in rich woods from Vermont to Kentucky, Wisconsin, and northward. The flowers, which appear in spring, are at first nearly white, but change with age to rose color. They are borne on a peduncle from 2 to 3 inches long. *Trillium erectum* has brownish-purple, sometimes white or pink pedunculate flowers. *Trillium sessile* has brownish-purple sessile flowers. *Trillium nivale*, a smaller plant, has white flowers that appear very early in spring.

COMMON WAKE-ROBIN (*Trillium erectum*).

TRI'LOBI'TA (Neo-Lat. nom. pl., from Gk. *τρεῖς*, *treis*, three + *λόβος*, *lobos*, lobe). An important group of extinct marine crablike animals, whose fossil body shields are found in rocks of Paleozoic age in most parts of the world. The trilobites constitute a subclass of Crustacea, of which class they are very primitive members. The trilobite body was covered by a hard, calcareous dorsal shield and a thin ventral integument. The dorsal shield or carapace is of elliptical or oval outline and is divided by two dorsal furrows into three longitudinal lobes, the median axis and two lateral pleural lobes. This trilobate division, which characterizes this class of animals, gave the group its name. The shield is also divided into three transverse parts: the anterior head shield or cephalon, the median thorax consisting of several movable segments, and the posterior abdominal shield or pygidium. The cephalon is generally of semicircular outline, and the posterior lateral corners, known as the genal angles, are often produced into spines. The more elevated median portion of the cephalon is the glabella, and this is separated from the cheeks or lateral portions by the usually well-marked dorsal furrows. The surface of the glabella is broken up into a series of lobes by three pairs of transverse furrows, called the lateral furrows. The paired lobes are called the lateral lobes, and the unpaired anterior lobe, which is often very prominently developed, is known as the frontal lobe of the glabella. The cheeks are traversed in most trilobites by a sinuous line, the facial suture, along which the lateral portions or free cheeks break away from the fixed cheeks.

The trilobites possess lateral or compound eyes and median or parietal eyes. The lateral eyes, which in most trilobites are of reniform shape, are situated upon the cheeks. In some species (as *Acidaspis mira*) these eyes are placed at the summits of high immovable peduncles; in certain genera (as *Agnostus*, *Eodiscus*, and *Ampyx*) the lateral eyes become atrophied; and other genera (as *Trinucleus*) have lateral eye spots in their young stages and only median ocelli when adult. Two types of lateral eyes are present—compound, situated

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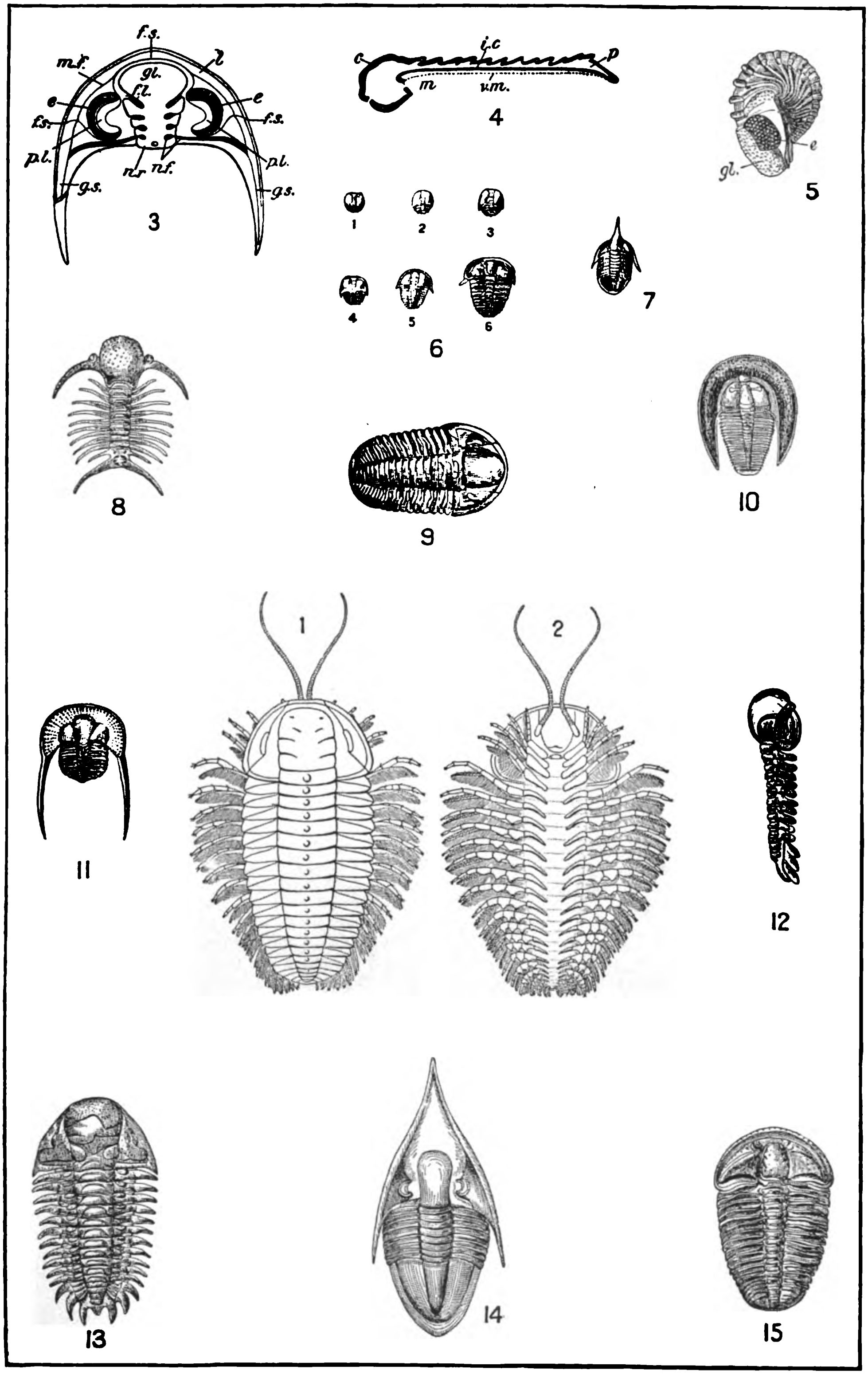
REPRESENTATIVE TRILOBITES

1. Dorsal view of a trilobite (*Triarthrus becki*), a species whose perfect specimens, preserved in the Utica slate (Ordovician), near Rome, N. Y., have yielded most of the known facts as to the external structure and appearance of these animals. 2. Ventral view of the same. 3. Cephalic shield (cephalon) of *Dalmanites hausmanni* (Devonian): *l*, limb or border; *m.f.*, marginal furrow; *g.s.*, genal spines: *gl.*, glabella; *f.l.*, frontal lobe, beneath which are seen the "side lobes" and "side furrows" of the glabella; *n.f.*, occipital furrow; *n.r.*, occipital ring; *f.s.*, facial suture; *s*, visual surface of eye; *p.l.*, palpebral lobe. 4. Median antero-posterior vertical section of a trilobite (*Ceraurus pleurexanthemus*); *c*, cephalon, with hypostoma below it; *p*, test of the abdomen (pygidium); *m*, mouth; *v.m.*, ventral membrane; *i.c.*, intestinal canal. 5. A trilobite (*Phacops latifrons:* Devonian), rolled up; *gl*, glabella; *e*, eye. 6. Development (ontogeny) of a trilobite (*Sao hirsuta;* Cambrian); 1, 1st larval stage (protaspis); 2–6, successive nepionic stages of development. 7. *Ampyx nasuta* (Ordovician). 8. *Deiphon forbesi* (Silurian). 9. *Proëtus bohemicus* (Silurian). 10. *Eoharpes ungula* (Ordovician). 11. *Cryptolithus goldfussi* (Ordovician). 12. Profile view of *Sphærexochus mirus* (Silurian). 13. *Cheirurus insignis* (Silurian). 14. *Megalaspis extenuata* (Ordovician). 15. *Conocoryphe sulzeri* (Cambrian) without the free cheeks. (After Zittel.)

REPRESENTATIVE TRILOBITES



For names and description, see text.

on the free cheeks, and simple eye spots, ocelli or stemmata. The compound eyes are made up of lenses, which may vary in number from 14 in *Trimerocéphalus* to 15,000 in *Remopleurides*. The median or parietal eyes consist of an ocellus with or without lens situated on the apex of the glabella. It is most prominent in the earlier growth stages, in Ordovician forms and in trilobites with atrophied lateral eyes ("blind" trilobites). The facial suture varies largely in its course across the cephalon, not only in the different species and genera, but also in the individuals that represent different stages of development of a single species. Its position in the adult furnishes an excellent diagnostic character. It is absent in the earliest Cambrian trilobites. In most trilobites a groove, the occipital furrow, runs near to and parallel with the posterior margin of the cephalon, and cuts off the occipital lobe from the glabella.

The thorax is made up of several transverse segments which articulate with one another in such manner that some trilobites were able to roll themselves into a ball like the armadillo. The number of segments of the thorax is usually constant in the adults of each genus, but it varies within the subclass from two in *Agnostus* to 42 in *Menomonia*. The pygidium, or caudal shield, is a solid plate formed by union of several segments, of which traces are still evident in the ribs of its convex dorsal surface. The axis and the pleural ribs are usually present, but in some species of *Asaphus* and *Illænus* they are almost entirely suppressed. The trilobite carapace is generally ornamented by small tubercles. Many genera have smooth or punctate tests; others have the test marked by concentric wrinkles; and in other genera spines are developed.

Ventral Surface. As a rule the ventral surface of the trilobite body is so closely united with the rock matrix that it is only through exceptionally favorable modes of fossilization that anything at all has been learned about the nature of the ventral integument and the appendages. The principal organ on the underside of the head is a rather prominent plate, the upper lip or hypostome, which articulates with the anterior margin of the cephalon, and which protects the small mouth opening at its posterior end. Each segment of the carapace, excepting the hindermost anal segment, bears a pair of appendages. The foremost pair, arising near the sides of the hypostome, are simple slender whiplike antennæ, much like those of the higher Crustacea. All the other appendages are biramous; their endopodites are six-jointed crawling legs, and their exopodites are many-jointed feathery organs that probably served both for swimming and respiration. The basal joints of the cephalic limbs form jawlike organs about the mouth.

Development. The ontogeny of several genera of trilobites is known. Small rounded bodies supposed to be the eggs of trilobites have been found. Those species of which continuous series of growth stages have been studied are found to originate in a minute protaspis stage and to attain their adult shape through a series of progressive changes expressed in the successive molts, in much the same manner as do the crabs, and other Crustacea. The protaspis is a circular or ovate shield, generally less than one millimeter in length, with a slightly segmented median axis and an indistinctly marked abdominal portion. Growth of the animal takes place by increase in the number of segments and through increase in size in the successive molts, and each new segment is intercalated between the cephalon or the last-formed segment and the anterior edge of the pygidium.

Classification. The form and mode of development of the free cheeks are made the principal features of the classification proposed by Beecher, who divides the subclass into three orders: Hypoparia, the most primitive forms of trilobites, mostly small in size, without compound eyes, and with simple eye spots in the higher genera. This order has lately been shown to be based on a misconception and the genera distributed among the other two orders. In its place a new order, Protoparia, has been erected for the Marellidæ, which still lack the facial suture (genera *Marella* and *Nathorstia*) and link the trilobites to the branchiopods and merostomes. Opisthoparia, with free cheeks dorsal, separate and carrying the genal angles. This group includes a large number of genera ranging from Cambrian to Carboniferous, but the majority of them are found in the Cambrian and Ordovician rocks. The Opisthoparia are divided into the suborders Mesonacida, Conocoryphida, Trinucleida, and Odontopleurida. The Mesonacida comprise the families Mesonacidæ, Paradoxidæ, and Zacanthoidæ. The Mesonacidæ contain the most primitive true trilobites: in them facial sutures are not yet distinguishable, segments are very numerous, and the pygidium very small. The Conocoryphida embrace the main body of the Opisthoparia, viz., the families Prœtidæ, Olenidæ, Oryctocephalidæ, Ptychoparidæ, Dikellocephalidæ, Bathyuridæ, Asaphidæ, Illænidæ, Calymenidæ, and Homalonotidæ. The suborder Trinucleida contains the families Harpedidæ, Trinucleidæ, Rhaphiophoridæ, Ellipsocephalidæ, Æglinidæ, Shumardidæ. The last suborder of the Opisthoparia, the Odontopleurida, contains the families Odontopleuridæ, Bronteidæ, and Lichadidæ. The last-named family has among its representatives some of the most specialized as well as the largest trilobites. The Odontopleuridæ, with species ranging from the Ordovician to the Devonian, are remarkable because of excessive development of the spines. In the order Proparia the free cheeks do not carry the genal angles and they are often united in front of the glabella. The other orders had their origin in pre-Cambrian time, for they appear in the early Cambrian with their diagnostic features fully differentiated and with a considerable degree of evolution, but the Proparia originated during the late Cambrian and were initiated in the early Ordovician. The order reached its maximum evolution during the Ordovician and declined during the Silurian and Devonian. The members of the family Encrinuridæ recall in the form of their cephalon the more primitive members of the Opisthoparia, and like them they have narrow marginal free cheeks, which do not, however, include the genal angles. The principal genera are *Encrinurus* (Ordovician to Silurian), *Placoparia*, *Cybele*, and *Dindymene* (Ordovician). Cheiruridæ is an interesting family that begins in the Ordovician and ranges into the Devonian and is represented by a number of species. The principal genera are: *Amphion* (Ordovician), *Ceraurus*, *Sphærexochus*, *Staurocephalus* (Ordovician to Silurian), *Deiphon*, and *Onycopyge* (Silurian). Phacopidæ is a large family containing perhaps the most highly organized members of the subclass. The frontal lobe of the glabella is large in all genera, and in the successive species in each race there is a general tendency towards coalescence or obsolescence of the lateral lobes of the glabella, and an increased prominence of the frontal lobe. The eyes are well developed and have large distinct facets. The family includes *Phacops* (Silurian to Upper Devonian), *Pterygometopus* (Ordovician), *Acaste* and *Chasmops* (Ordovician to Silurian), *Trimerocephalus* (Silurian to Devonian), *Dalmanites* (Ordovician to Devonian), and a number of subgenera. Here also belong the Cambrian Burlingidæ and probably the blind primitive Agnostidæ, also of Cambrian age.

Habits. Trilobites appear to have been entirely marine with various modes of existence. Some were bottom crawlers, as Dalmanites; others buried themselves in the mud of the bottom, thereby losing their eyesight, and developing a broad brim (as *Harpes*, *Cryptolithus*, and *Trinucleus*); and still others were free swimmers with big eyes, as Æglina, or crawled about coral and hydroid masses, like the modern isopods. The remains of trilobites are usually found in dismembered condition, and entire carapaces are rare. This is probably due to the fact that the majority of specimens are the discarded molts, broken in the process of shedding. Trilobites abound in all the Cambrian formations, during which period they were in fact dominant forms of life, and they are abundant in some horizons of the Ordovician and Silurian. During the Devonian they declined rapidly, and only a few genera, represented by rare specimens, continued into the Carboniferous. They are entirely absent from all Mesozoic rocks, and they have no near relatives at the present day. They are one of the most important groups of fossil animals for purposes of correlation. In all about 2000 species and over 200 genera have been described, the majority of them from the Cambrian and Ordovician rock. See ACIDASPIS; HARPES.

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TRIL'OGY (from Gk. *τριλογία*, *trilogia*, group of three dramas, from *τρεις*, *treis*, three + *λόγος*, *logos*, word). The name given by the Greeks to a group of three tragedies, often connected by a common subject and representing different stages or phases of the same story. A satyric drama was customarily added as a termination, whence the whole was sometimes termed a tetralogy. A tragic poet who wished to take part in one of the Athenian poetic contests had to produce a trilogy along with a satyric drama at the great Dionysiac, Lenæan, or Anthesteriac festival. We possess only one perfect specimen of the classic trilogy—the *Oresteia* of Æschylus, which embraces the *Agamemnon*, the *Choephoræ*, and the *Eumenides*. Consult: Welcker, *Die Aeschyleische Trilogie, etc.* (Darmstadt, 1824); Franz, *Des Aeschylus Oresteia* (Leipzig, 1846); Campbell, *The Oresteia of Æschylus*, translation and introduction (London, 1893).

TRIM, CORPORAL. The devoted companion of Uncle Toby in Sterne's *Tristram Shandy*.

TRIMBLE, trĭm'bl, ROBERT (1777–1828). An American jurist, born in Berkeley Co., Va. (now W. Va.). He was admitted to the Kentucky bar in 1803 and subsequently was elected to the Legislature. In 1808 he was appointed second judge of the Court of Appeals, in 1810 Chief Justice of Kentucky, and in 1813 United States district attorney. From 1816 to 1826 he was district judge of Kentucky, and from 1826 until his death a justice of the United States Supreme Court.

TRIMETH'YLAM'INE (from *tri-* + *methyl* + *amine*), $(CH_3)_3N$. An organic base with a powerful and disagreeable fishy odor. It is obtained as a colorless gas, readily soluble in water, and, in aqueous solution, acting as a strong alkali. With acids it forms soluble salts. It is obtained by distillation from ergot of rye, from guano, from the juice of the leaves of red beet root, and from putrid yeast. It may be formed artificially by the action of methyl iodide on dimethylamine, but the source from which it is most readily derived is herring brine. See AMINES.

TRIM'MER, MRS. SARAH (1741–1810). An English author. Settling with her parents in London, she became one of the pioneers in founding Sunday schools. Her first schools were opened at Brentford in 1786 and were so successful that she was summoned by the Queen to Windsor to help start others there. In 1787 she also established at Brentford a school of industry for girls. Later she introduced into the Sunday school the plan of teaching by prints. Among her books are: *Easy Introduction to the Knowledge of Nature* (1782; 11th ed., 1802); the books with pictures and explanations which after a large circulation were issued as *New and Comprehensive Lessons* (1814; 5th ed., 1830); *Abridgments of the Old and New Testaments*, which, issued separately by the Society for Promoting Christian Knowledge in 1793, circulated a quarter of a million copies.

TRIMOR′PHISM. See POLLINATION.

TRIMOR′PHOS. See ISOMORPHISM.

TRIMURTI, trē̇-mōōr′tē̇ (Skt. *tri-mūrti*, triple form). The name of the Hindu trinity, consisting of the gods Brahma (q.v.), Vishnu (q.v.), and Siva (q.v.), when regarded as an inseparable unity of creation, preservation, and destruction, though three in form. The concept is relatively late and cannot be older than the fifth or sixth century A.D. It is probable that the gods Vishnu and Siva were first associated as representatives of the two great Hindu sects (see SAIVAS; VAISHNAVAS) and that Brahma was added at a later time, as he was a later philosophical concept. In Indian art the Trimurti is one body with three heads, and its symbol is the mystic syllable *ōm* (q.v.). Consult E. W. Hopkins, *Religions of India* (Boston, 1895).

TRIN′COMALEE′, or **TRINCOMALI,** trĭŋ′-kō̇-mä′lē̇. A seaport town and former naval station on the northeast coast of Ceylon, 99 miles northeast of Kandy (Map: India, D 8). It is situated on an elevated and precipitous peninsula on the north side of the fine harbor of Trincomalee, the best in Ceylon. The temple of the Thousand Columns, now in ruins, was erected by the Malabars and destroyed by the Portuguese in 1622. It is still a famous place of pilgrimage of the Hindus. Near the ruins rises Fort Frederick, which was built by the Portuguese from the old material of the temple. Pop., 1901, 13,000; 1911, 11,067. Trincomalee was one of the last towns to surrender to European authority. It was held successively by the Portuguese, Dutch, and French and surrendered to the British forces after a naval siege of three weeks in 1795. Consult H. W. Cave, *The Ruined Cities of Ceylon* (London, 1900).

TRINE, RALPH WALDO (1866-). An American author. He was born at Mount Morris, Ill., graduated at Knox College in 1891, and later studied political and social science at Johns Hopkins. For a time he taught school, lectured, and worked as a bank cashier and special newspaper correspondent; but later he devoted his time to writing on topics related to ethical improvement and especially to New Thought (q.v.). He removed to Croton-on-Hudson, where he engaged also in fruit culture. His publications, some of which have been widely translated, include: *What All the World's a-Seeking* (1896; 21st ed., 1915); *In Tune with the Infinite* (1898), which reached a large circulation; *The Land of Living Men* (1910); *The New Alinement of Life* (1913); and booklets on similar subjects.

TRIN′IDAD′. An island lying off the South American coast (Map: West Indies, G 5). To the northeast is the island of Tobago; together they constitute the British Colony of Trinidad and Tobago. The area of the colony is 1868 square miles, Tobago covering 114 square miles and Trinidad 1754 square miles. Trinidad has only one good natural harbor, at Chaguaramas on the west coast, but the whole Gulf of Paria is safe for anchorage; the north coast is rockbound, the south coast steep, and the east coast exposed to heavy surf. At Chaguaramas are a government floating dock and workshops for ship repairs. Trinidad is traversed, roughly from east to west, by three ranges of hills, two being parallel with the north and south coasts and the third crossing the middle of the island. In the northwest Mount Tucuche reaches an altitude of 3100 feet. The mineral resources are becoming important, the minerals now worked being asphalt, manjak, and petroleum. In the southwest is the famous Pitch Lake, near the Gulf of Paria and in La Brea ward; this lake, yielding large quantities of asphalt for export (206,400 tons in 1913), covers 114 acres. Trinidad has numerous streams and a well-watered, fertile soil adapted to the growth of many tropical products; agriculturally the island is one of the most successful of the British West Indian possessions. The staple products are sugar (1913 export, 653,098 hundredweights), cacao (482,534 hundredweights), and coconuts (16,391,000). Commercially the colony ranks first in the British West Indies; imports and exports in 1913 were valued at £4,968,350 and £5,205,673 respectively. Values of leading exports in 1913: cacao, £1,403,379; sugar, £418,067; asphalt, £230,565; coconuts, £85,369; petroleum, £75,020. The trade is mainly with the United Kingdom, the United States, Venezuela, and France. The trade of the United States with Trinidad was in 1915: imports from Trinidad $6,739,000, exports thereto, $3,971,000. Imports were chiefly cacao, fruits and nuts, chemicals, and asphalt; exports, flour, coal, meats, mineral oil, and miscellaneous merchandise. Trinidad has 95 miles of railway. The colony is administered by a governor, who is assisted by an executive and a legislative council, all members being appointed. The revenue and expenditure in 1913-14 were £970,789 and £951,982 (customs receipts, £467,374); public debt in 1913, £1,476,614. Education is largely subsidized by the government; the total school enrollment is upward of 51,000. Pop., 1901, 273,899; 1911, 333,552 (312,803 in Trinidad, 20,749 in Tobago). The white population is small, principally English, French, and Spanish; a large number of inhabitants are of mixed European and African blood, speaking a French patois. There are upward of 110,000 East Indian coolies whose immigration is under government control. Port of Spain, capital of the colony, on the northwest coast of Trinidad, has over 60,000 inhabitants and is one of the finest towns in the West Indies. Other towns are San Fernando (pop., 8667), Princess Town (4497), and Arima (4020).

Trinidad was discovered by Columbus, July 31, 1498. A governor was appointed in 1532, but for many years the Spanish colonists made little progress. San José, the capital, was burned by Sir Walter Raleigh in 1595. In 1640 and 1677 Trinidad was raided by the Dutch and in 1690 by the French. Towards the end of the eighteenth century there was a considerable immigration, encouraged by the Spanish government and augmented by many French families driven from Haiti and other islands. In February, 1797, Trinidad capitulated to a British force and in 1802 was finally ceded to Great Britain by the Treaty of Amiens.

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TRINIDAD. A small, rocky, and uninhabited island situated in the South Atlantic Ocean in lat. 20° 31′ S., long. 29° 20′ W., about 750 miles east by north of Rio de Janeiro (Map: World, Western Hemisphere, M 18). It now belongs to Brazil.

TRINIDAD. A town in Cuba, in the Province of Santa Clara, situated about 45 miles southeast of Cienfuegos and 5 miles from its port, Casilda (Map: Cuba, E 5). It is within easy reach of three ports and is of considerable commercial importance. It is one of the most healthful places on the island. Coffee, formerly the chief article of export, is gradually giving place to sugar. Trinidad was founded by Velazquez in 1514 and on account of the repeated attacks by buccaneers was removed from the coast to its present site. Pop., 1907, 11,197.

TRINIDAD. A city and the county seat of Las Animas Co., Colo., 90 miles by rail south of Pueblo, on the Denver and Rio Grande, the Atchison, Topeka, and Santa Fe, the Colorado and Wyoming, and the Colorado and Southern railroads (Map: Colorado, E 4). It has a public library, St. Joseph's Academy, and St. Raphael's Hospital. Trinidad is the centre of large cattle and sheep raising and farming interests and is extensively engaged in coal mining and coke manufacture. There are also railway shops, bottling works, and a powder mill. Pop., 1900, 5345; 1910, 10,204; 1915 (U. S. est.), 13,337.

TRINIL (trē′nil) **MAN.** See MAN, SCIENCE OF, *Ancient Types.*

TRIN′ITA′RIANS (from *trinity*, Lat. *trinitas*, number three, trinity, from *trinus*, threefold, from *tres*, three). The name most commonly applied in English to the members of the Order of the Holy Trinity for the Redemption of Captives, a Roman Catholic religious society founded by St. John de Matha (1160–1213) and St. Felix of Valois (1127–1212). Devoted to the work of freeing Christian captives among the infidels, they soon received the approbation of Pope Innocent III (1198) and the permission of Philip Augustus to settle in France. The headquarters of the order were at Cerfroid, near La Ferté Milon, in the present Department of Aisne, and the Pope gave them a second convent in Rome. Their first journey resulted in the liberation of 186 captives, who were brought to Paris amid great rejoicings. While Felix remained at home, caring for the order's development, John made numerous journeys to north Africa and the coast of Spain. Later the Trinitarians erected houses for the care of penniless captives after their release, and some of them accompanied the Crusaders to minister to their spiritual needs; they penetrated even to India and Tartary in search of the objects of their charity. It is estimated that in six centuries at least 900,000 prisoners recovered their freedom through the work of this order.

The order spread rapidly, first through France and Spain, until in the fifteenth century it counted 880 houses; the number diminished from various causes until at the beginning of the eighteenth century there were only 250. The present members are chiefly occupied with other works of mercy, especially the care of the sick, although in the nineteenth century they devoted considerable labor to the work for negro slaves. Besides several branches, due to various reforms, among the male Trinitarians, there were also two female branches, and a third order of associates who labored for the cause and under a simple rule lived in the world. Consult: Carlier, *Les trinitaires de la rédemption* (Lille, 1866); Père Calixte de la Providence, *Vie de Saint Félix de Valois* (3d ed., Paris, 1878); id., *Vie de Saint Jean de Matha* (2d ed., ib., 1884); id., *Corsaires et rédempteurs* (Lille, 1884); Deslandres, *L'Ordre des trinitaires* (Paris, 1903).

TRINI′TROTOL′UENES. Nitrosubstitution compounds produced by the substitution of nitro (NO_2) groups for hydrogen atoms in toluene ($C_6H_5 \cdot CH_3$). Toluene is also known as methyl benzene. Because hydrogen atoms can be replaced not only in the C_6H_5 group but also in the CH_3 group, it becomes possible, through the different positions these three NO_2 groups may occupy in the molecule as regards one another, to produce 12 different trinitrotoluenes, each of which exhibits its individual characteristics, such as melting point, boiling point, specific gravity, solubility, sensitiveness to detonation, and the like. All are produced by nitration of the hydrocarbon or its products or by indirect reactions. Trotyl, known also as T. N. T., is that trinitrotoluene which, as obtained in reaction, is at ordinary temperatures a white to pale-yellow crystalline solid having a melting point of 80.6° C. It is now widely adopted as the bursting charge for armor-piercing projectiles and for torpedoes and mines. It is a very stable body, does not attack metals, is nonhygroscopic, and practically insoluble in water. Under the influence of detonating mercury fulminate it explodes with great violence. It is loaded in shells in the molten condition and by cooling under pressure attains a density of 1.7. Its detonation arouses a higher activity in detonating explosives, such as the dynamites and permissible explosives, than mercury fulminate does; hence it is coming into use in detonators and fuse. A form of the latter known as *cordeau detonant* is formed by filling a lead tube with molten trotyl. The tube is drawn through a draw plate until it is so reduced in size as to fit easily into the copper capsules of the commercial detonators or blasting caps. The detonation of the Detonator causes the detonation of the T. N. T. in the lead tube, which is thus communicated at the rate of 4000 meters per second to other detonators or charges of explosives. By its use separated charges of explosive may be fired practically simultaneously.

TRIN′ITY. A port of entry on Trinity Bay, Newfoundland, the capital of Trinity District, 61 miles northwest direct of St. John's (Map: Newfoundland, G 4). It has important fishing industries and a fine harbor. The bay is the landing point of the Atlantic cables. Pop., 1901, 1459; 1911, 1604.

TRINITY, DOCTRINE OF THE. A doctrine of theology which declares that there are three persons in the Godhead, or divine nature—the Father, the Son, and the Holy Ghost—and that "these three are one true eternal God, the same in substance, equal in power and glory—although distinguished by their personal properties." The most elaborate statement of the doctrine is to be found in the Athanasian Creed, which asserts that "the Catholic faith is this: That we worship one God in Trinity, and Trinity in Unity—neither confounding the persons nor dividing the substance—for there is one person of the Father, another of the Son, and another of the Holy Ghost. But the Godhead of the Father, and of the Son, and of the Holy Ghost is all one; the glory equal; the majesty coeternal."

The doctrine is not found in its fully developed form in the Scriptures. Modern theology does not seek to find it in the Old Testament. In the New Testament the elements out of which it has been constructed are sought in the Trinitarian formula of baptism, the general character of the claims and prerogatives of Jesus Christ by which his deity is established, and in the functions attributed to the Holy Spirit. It is generally conceded, however, that the Christians of the second and even of the third century were content for the most part to use scriptural expressions in speaking of the Father and the Son and the Spirit, without defining articulately their relation to one another. The term Trinitas was first used by Tertullian, but the concept took form only in the debates of christology (q.v.). It was not until the progress of opposing parties sought, on the one hand, to degrade the divine dignity of Christ (Ebionitism in its various forms and Arianism), or, on the other hand, to confound the personality of Christ with God the Father (see MONARCHIANS), that the Church was led to define in the Nicene Creed the relation of the Son to the Father, and further, in the Nicæno-Constantinopolitan Creed, the relation of the Spirit to the Father. This creed (see NICENE CREED; FILIOQUE) was specially directed against the opinions of Arius (q.v.). There was never much discussion regarding the place and nature of the Spirit.

At the time of the Reformation the Protestant church took over the doctrine of the Trinity without serious examination. The only exception in modern times to the reception of the doctrine is in the case of the Socinians or Unitarians (see SOCINUS), who occupy in their teaching very much the position of the ancient Humanitarians (Ebionites).

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TRINITY CHURCH. The name of a great number of churches in France, England, and the United States. The most famous of these are: in France, that built by Matilda of Normandy at Caen, commonly called l'Abbaye aux Dames (c.1046 A.D.); in England the cathedrals of Bristol, Chichester, Gloucester, and Norwich, and the parish churches of Hull and Stratford-on-Avon; in the United States, parish churches at New York by Upjohn (1843) and at Boston by Gambrill and Richardson (1876).

TRINITY COLLEGE. A college at Cambridge, England, the largest and most splendid collegiate foundation in the realm. It was founded by Henry VIII in 1546 by the consolidation of several earlier foundations, with considerable additional endowments from other sources for a master and 60 fellows and scholars. Edward VI issued the statutes, Mary added 20 scholars and increased the endowment, and Elizabeth interested herself in the college. It is governed by a council, consisting of the master and four other ex-officio members, and eight elective members. The buildings are large and imposing; the great court is the largest in either university, comprising over two acres. The gateway is striking and characteristic, the Hall one of the finest in England. The chapel, though of great size, is not so fine as that of King's. The library is a large and important collection. Among Trinity worthies may be mentioned Bacon, Newton, Barrow, Coke, Dryden, Cowley, Byron, Tennyson, Edward FitzGerald, Thackeray, Macaulay, Richard Porson, and Peacock. Some distinguished masters were William Bill, John Whitgift, Thomas Neville, Barrow, Bentley, and William Whewell. The master of Trinity is appointed by the crown, and the college has apartments for the occupancy of royalty when on a visit to Cambridge as well as for the judges on assize. There were in 1913–14 in the college 70 fellows, 72 scholars, and 672 other students. Consult Mullinger, *History of Cambridge University* (Cambridge, 1884), and Boughey and Clark, *Trinity College* (London, 1900).

TRINITY COLLEGE. See DUBLIN, UNIVERSITY OF.

TRINITY COLLEGE. A college at Oxford, England, founded in 1554 by Sir Thomas Pope, Privy Councilor to Henry VIII and Queen Mary. The college occupied the site and buildings of a Benedictine mansion called Durham College, which had been founded in 1290 by Richard de Hoton, Prior of Durham, for the education of the monks of that diocese. At the dissolution of the monasteries this passed into the hands of the newly constituted chapter of Durham and thence to Sir Thomas Pope. Trinity College was the first college founded by a layman since Balliol and consisted at first of a president, 12 fellows, and 12 scholars. Pope was a Roman Catholic, and his charter was obtained from Philip and Mary. By the changes made in 17 and 18 Vict., the college consists of a president, 12 fellowships, of which nine are occupied, several honorary fellows and lecturers, a chaplain, college officers, 30 scholars and exhibitioners, and in all about 200 undergraduates. The buildings are of various dates and are arranged in a most attractive open quadrangle. The college presents to 10 livings. Among the distinguished men who have been connected with Trinity may be mentioned Archbishop Sheldon, Bishop Seth Ward, Ludlow and Ireton of Civil War fame, Thomas Warton the poet and critic, Cardinal Newman, the elder Pitt, Lord North, Landor, Stubbs, Freeman, George Rawlinson, and Bryce. Consult H. E. D. Blakiston, *Trinity College* (London, 1898).

TRINITY COLLEGE. An institution at Hartford, Conn., founded by members of the Protestant Episcopal church in 1823 as Washington College, the present name being assumed in 1845. The college offers two courses, leading to the degrees of B.A. and B.S. It also offers graduate courses leading to the degrees of M.A. and M.S. There is a system of alternative and elective studies, most of the work of the last three years being elective. It has no professional schools, but offers courses in civil engineering. The productive endowment in 1916 was $1,232,000 with a gross income from endowment and students' fees of $75,000. The library in that year contained about 80,000 volumes and about 40,000 pamphlets. The students numbered 237 and the faculty 25. The total value of buildings and grounds is about $1,250,000. The president in 1916 was Rev. Flavel S. Luther, LL.D.

TRINITY COLLEGE. An institution for higher education founded as Normal College in Randolph Co., N. C., in 1851. It passed under the control of the Methodist Episcopal Church South in 1856 and in 1859 took the name of Trinity College. In 1891 the college was removed to Durham and opened its first session in 1892. In 1897 the trustees authorized the admission of women as students to all the departments. A new charter was granted to the college in 1903. The college confers the degrees B.A. and M.A., and its curriculum includes the regular college departments. A school of education was established in 1910, and there is also a department of law established in 1904. The enrollment in all departments of the college in the autumn of 1915 was 653, and the faculty numbered 45. A campaign for an endowment fund carried on in 1912–13 resulted in contributions (in addition to $800,000 and $200,000 for buildings, given by Messrs. N. and James B. Duke, and $150,000 given by the general education board) of $268,146, making a total of $1,418,146. The library contains about 48,000 volumes. The president in 1916 was William P. Few, Ph.D., LL.D.

TRINITY HALL. A college at Cambridge, England. It was founded in 1350 by William Bateman, Bishop of Norwich and cofounder of Gonville and Caius College, under the name of the College of the Scholars of the Holy Trinity of Norwich, for a master and 30 scholars, devoted to the canon and civil law. It continues to be the peculiarly legal college of the university. By the new statutes in force since 1882 the college consists of a master and 18 fellows. There are also college officials, two law students, 12 scholars and exhibitioners, and, in all, about 150 undergraduates. The college presents to seven livings. Among the distinguished members of the college have been Bishop Stephen Gardiner (Master), Glisson the anatomist, Lord Howard of Effingham, Chesterfield, Thomas Bilney, and Chief Justice Cockburn. Consult H. E. Malden, *Trinity Hall* (London, 1902).

TRINITY HOUSE, CORPORATION OF. A British corporation which controls the greater part of the important lighthouses, light vessels, and fog signals on the English coast, the others being under the supervision of the Admiralty, the Mersey Docks and Harbor Board, and various local marine authorities. The headquarters of the corporation are in London, and among its chief duties are the lighting and buoyage of the Thames and adjacent coast. Other companies, bearing the same name but with less important duties, exist in some other ports. The London corporation has nothing to do with the Scottish or Irish coast, the former being under the Northern Lighthouse Commissioners and the Clyde Lighthouse Trustees, and the latter under the Irish Lights Commissioners. The London corporation, the original Trinity House, had previously existed as a religious fraternity which took upon itself certain duties connected with pilotage and the safety of mariners. It was incorporated during the reign of Henry VIII and gradually extended its work. It is managed by a board called the Elder Brethren, of which two are selected from the navy and 11 from the merchant service. Consult Mayo, *Trinity House, London Past and Present* (London, 1905). See LIGHTHOUSE.

TRINITY RIVER. A river of Texas, formed by a network of small streams in Montague, Jack, Wise, Denton, and Parker counties, Tex. Above Dallas the stream frequently runs dry (Map: Texas, E 4). It flows southeast through a fertile and well-timbered region and empties into Galveston Bay about 40 miles north of the city of Galveston. It is over 550 miles long and navigable at high water for 300 miles.

TRINITY SUNDAY. The Sunday immediately following Whitsunday, so called as being set aside for the special honor of the Trinity. No such festival was known to the early centuries; the general establishment of Trinity Sunday as a common festival of the whole Western Church dates from a decree of John XXII, who died in 1334. Nevertheless, the mass and office peculiar to the day are of much greater antiquity and may be traced, at least in part, in several liturgical books of the earlier centuries.

TRINO′DA NECES′SITAS (ML., threefold necessity). Three forms of assessment of lands for public purposes during the Anglo-Saxon era. No lands, either in secular or religious hands, were exempt from these three duties, which were known as bridge bot, for the maintenance of bridges and highways; burg bot, for the erection of and keeping fortresses in repair; and fyrd, for the support of the King's military and naval forces. Blackstone mentions that in the time of Henry II no less than 1115 castles were in existence as a result of the tax for the establishment and maintenance of strongholds. Consult Blackstone, *Commentaries*.

TRINUCLEUS, trī′nū′klē-ŭs (Neo-Lat., from Lat. *tres*, three + *nucleus*, little nut, kernel, nucleus). A genus of trilobites characteristic of the middle and upper Ordovician rocks of North America and Europe. The body is small, seldom exceeding an inch in length, with a relatively large and broad horseshoe-shaped head shield. The glabella is convex and consists of a prominent median and two less elevated lateral lobes, and the head is bordered by a wide pitted margin and provided with long, sometimes bifurcated, genal spines. In some forms the young were provided with simple eyes (ocelli) on the cheeks, and compound eyes, such as are seen in most trilobites, are entirely absent, while probably all had a median eye. The thorax has six segments with narrow axis, and the pygidium is small and of broadly triangular form. See TRILOBITA.

TRINUM'MUS. A comedy by Plautus (about 194 B.C.), founded on Philemon's *Thesauros*.

TRIO, trē'ō *or* trī'ō (It., musical composition in three parts). In music, in a general sense, a composition for three voices or for three instruments. In instrumental music a trio is usually understood to mean a composition written for piano, cello, and violin. But it is better to apply the name "piano trio." A string trio is generally written for violin, viola, and cello, or two violins and cello. In a specific sense the term "trio" is used to denote a middle section in minuets, marches, or scherzi. It derived its name from the fact that the older composers employed three-part writing in this middle section.

TRIOLEIN, trī-ō'lē-in. See OLEIN.

TRI'ONAL $(CH_3)(C_2H_5)C(SO_2C_2H_5)_2$. A white crystalline compound used as a hypnotic. It is prepared by the action of methyl-ethyl ketone (a substance similar to acetone) upon mercaptan (q.v.) and the oxidation of the resulting product by permanganate of potassium. It melts at 76° C. (169° F.) and is readily soluble in alcohol, but sparingly in water. It is an excellent and harmless hypnotic, and, if used judiciously and administered in connection with a mild purgative, is believed to have no injurious effects. Like sulphonal (q.v.), it is best administered with hot milk. It is prompter in its action and safer than sulphonal.

TRIOSON, ANNE LOUIS GIRODET-. See GIRODET-TRIOSON, A. L.

TRIPAL'MITIN. See PALMITIN.

TRIPHENYL-METHYL, $(C_6H_5)_3C$ (?). A remarkable substance discovered by Gomberg in 1901, one of the carbon atoms in its molecule appearing to be trivalent (instead of quadrivalent, as carbon usually is). It may be prepared by the action of metals (say, silver) upon chloro-triphenyl-methane, $(C_6H_5)_3C.Cl$. It forms a colorless crystalline solid that melts at 145° C. (293° F.) and dissolves in various solvents with an orange-yellow color. It acts as a highly unsaturated compound, giving a peroxide by direct union with oxygen, an iodide with iodine, etc. When dissolved in liquid sulphur dioxide, it conducts the electric current. Molecular weight determinations show it to be made up mostly of double molecules, $[(C_6H_5)_3C]_2$, the color of its solutions being undoubtedly due to the quinoid structure of these double molecules; but there is now little doubt left but that single molecules of triphenyl-methyl exist, in dynamic equilibrium with the double molecules. Triphenyl-methyl is, obviously, a derivative of the radicle *methyl*, CH_3, which can only exist as part of a molecule, but not independently. See METHYL; SCHORLEMMER.

TRIPIT'AKA. See PITAKA.

TRIPLE ALLIANCE. The name given to the alliance between Germany, Austria, and Italy formed in 1882. Bismarck was primarily responsible for the system of alliances which shaped European diplomacy during the last quarter of the nineteenth century. In order to assure the isolation of France after the Franco-Prussian War of 1871 and prevent any effort to regain the territory of Alsace Lorraine, Bismarck sought to bring about a closer understanding between Germany, Russia, and Austria. In September, 1872, the Czar Alexander II and the Austrian Emperor Francis Joseph visited Berlin, and the chancellors of the three empires exchanged notes whereby they agreed to work together for the following purposes: the maintenance of the territorial boundaries recently laid down, the settlement of questions arising from the Eastern Question, and the repression of revolutionary movements in Europe. This was the so-called Three Emperors League. This league, however, lacked solidarity. Two of its members, Russia and Austria, had conflicting interests in the Balkans, and when at the Congress of Berlin, in 1878, Bismarck supported Austria in her determination to limit Russian influence in the Balkans, the alliance was broken. The withdrawal of Russia led to a closer union of the two central Powers. Bismarck and Count Andrassy came to an understanding in an interview at Gastein, Aug. 27–28, 1879. It was not until Nov. 5, 1887, that the terms of this treaty were made known, when they were published in the London *Times*. The compact provides that, if either Germany or Austria shall be attacked by Russia, each Power must assist its neighbor with all its forces. If, however, the attack shall come from any other Power, the ally is pledged merely to observe neutrality. Bismarck did not abandon his policy of maintaining friendly relations with his eastern neighbor, and in 1884, at a second meeting of the three emperors, he succeeded in renewing the old understanding. He also negotiated a secret "reinsurance compact" with Russia for mutual friendly neutrality in case either were attacked by a third Power. When Bismarck retired from office in 1890, Emperor William II abandoned that part of the former Chancellor's policy which called for a close understanding with Russia. He refused to renew the reinsurance compact and turned his attention to welding more solidly the alliance of the Teutonic Powers.

Italy's alliance with the Teutonic Powers was largely due to her resentment against France because of the latter's acquisition of Tunis in 1881. This territory was regarded by Italy as a field for her colonial expansion. Checkmated by France, Italy turned to the Germanic Powers, and on May 20, 1882, treaties were signed which bound Italy to the central Powers for a term of five years. Italy's position in the Triple Alliance was from the beginning an unnatural one. Bound to Austria, a country which had consistently opposed the movement for Italian unity and which still held provinces which Italy felt should be a part of the Italian nation, any real sympathy between these Powers was difficult to maintain. Moreover, the interests of these Powers clashed in the Balkans. Italy resented the acquisition of Bosnia and Herzegovina by Austria, and the extension of Austrian influence along the eastern shore of the Adriatic Sea was regarded as a menace by Italy. While the treaty was renewed at five-year intervals until 1902 and was then extended for 12 years, it was evident that Italy's allegiance rested on none too solid grounds. Evidence of her weakening support of the Teutonic Powers appeared at the Algeciras Conference in 1906, which attempted to settle the dispute over Morocco. A still more serious blow was given to the Alliance when Italy in 1911 seized Tripoli and declared war on Turkey, which Power had come to be considered a member of the Triple Alliance. It did not cause surprise, therefore, when, at the outbreak of the European War in 1914, Italy refused to join Germany and Austria, claiming that it was not a defensive war contemplated by the Treaty of Alliance. The terms of the treaty were not published, but during the early months of the war Italy stated that under the treaty she was entitled to "compensations" as a result of Austria's occupation of Servian territory. After several months of fruitless negotiations Italy, on May 3, 1915, formally withdrew from the Triple Alliance. Consult: F. H. Geffcken, *Frankreich, Russland, und den Dreibund: geschichtliche Rückblicke für die Gegenwart* (Berlin, 1893); Vincent Benedetti, *Studies in Diplomacy* (Eng. trans., New York, 1896); Francesco Crispi, *Memoirs of Francesco Crispi* (3 vols., ib., 1912–14). See Triple Entente; War in Europe.

TRIPLE ENTENTE. The name given to a number of agreements or "understandings" concluded between the governments of Great Britain, France, and Russia.

The effect of the formation of the Triple Alliance (q.v.) between Germany, Austria, and Italy in 1882 was to draw the other two great continental powers, France and Russia, together. This rapprochement at first took the form of large loans of money by France to Russia. These loans enabled Russia to consolidate her debt on easier terms, to build strategic railroads, and to increase the efficiency of her army and navy. In July, 1891, the French Channel fleet visited Cronstadt, and it is probable that at this time military and naval understandings between the two Powers were drawn up to serve as bases for common action. It was not until 1895 that the alliance was definitely avowed. The terms of the treaty were not disclosed. An unofficial version stated that if either nation were attacked the other would come to its aid with the whole of its military and naval forces.

Although England had always been included in the concert of European powers, she avoided limiting her freedom of action by declining to enter a fixed alliance with any of the great continental powers. Her unique geographical position and her control of the seas gave her great influence in maintaining the balance of power on the Continent. The grouping of the great continental powers into two opposing military alliances made it more difficult for Great Britain to maintain her policy of "splendid isolation." Moreover, Germany's frank adoption of naval policy in competition with Great Britain made the latter consider the dangers of her isolated position. There were, however, serious difficulties which had to be overcome, apart from the abandonment of her policy of aloofness, before England was able to join one of the European alliances. France and Russia were by long tradition hostile to England. With France England had serious disputes in regard to the partition of north Africa, about the boundaries of Siam, and about the Newfoundland fisheries. The two Powers nearly reached a break in 1898, when a French force tried to take possession of the upper waters of the Nile. (See Kodok.) Negotiations, however, led to a final understanding in 1904, by which England was conceded a predominant position in Egypt, and France a similar position in Morocco.

With Russia, Great Britain's causes of friction were chiefly two. In the first place England opposed the extension of Russian influence in the Balkans, and secondly England opposed the Russian advance towards the British possessions in India. The first of these causes of dispute was gradually removed as public feeling in England turned against the Turks in favor of the subject races in the Balkans which had been protected by Russia. The special point of difficulty in Asia was Persia. This country was in a state of chronic confusion and disorder, which was an invitation to two powerful nations, Great Britain and Russia, to intervene in its internal affairs. Each of these Powers was intriguing to prevent the other from gaining any advantage in this region. In 1907 Sir Edward Grey entered upon negotiations with the Russian government to settle these and other outstanding difficulties between the two Powers. There resulted a series of agreements respecting the countries of Tibet, Afghanistan, and Persia, which bordered the territorial possessions of the two Powers.

The way had thus been cleared for a close understanding between Great Britain, France, and Russia. The precise nature of this understanding was indefinite. There was no treaty agreement specifying its scope. Some light was thrown upon it in a speech made by Sir Edward Grey in the House of Commons on Aug. 3, 1914. He said that the Triple Entente was not an alliance, but a "diplomatic group." As to England's relations with France, he said that at the time of the Moroccan crisis in 1906 he had stated to the representatives of Germany and France that if war were forced on France because of the Moroccan dispute, "in my view public opinion in this country would have rallied to the material support of France." In view of such a contingency the French Minister suggested that, in order to make any coöperation effective, conversations should be held between the military and naval experts of the two countries. To this Sir Edward Grey agreed on the distinct understanding that nothing which passed between the military and naval experts should be binding on either government. In 1912, following the second Moroccan crisis, the British cabinet decided that it would be well to have an understanding in writing that these conversations were not binding upon the freedom of either government. Accordingly Sir Edward Grey wrote to M. Cambon, the French Ambassador, stating clearly that the military conversations were not binding, but at the same time he agreed that in case either country were attacked by a third Power "it should immediately discuss with the other whether both governments should act together to prevent aggression and to preserve peace."

In regard to England's relations to Russia Sir Edward Grey stated, "We are not parties to Franco-Russian alliance. We do not even know the terms of that alliance."

With the outbreak of the European War in 1914, this rather vague and loose Entente was made more binding, when on Sept. 5, 1914, the representatives of the three Powers agreed not to conclude a separate peace with Germany and Austria, and secondly that when the terms of peace should be discussed no one of the allies should demand conditions of peace without previous agreement with the other allies. See War in Europe.

TRIP'LET (from *triple*, Fr. *triple*, from Lat. *triplus*, threefold). In music, a group of three equal notes, to be performed in the time of two of like value in the regular rhythm. For instance, when a quarter note is divided into three eighth notes, the group is called a triplet, and it is usual to place the figure 3 over it.

TRIPOLI, trĭp'ō-lĭ. Formerly a vilayet of the Ottoman Empire. The name is now often applied to the Italian possession of Libya, situated on the northern coast of Africa between the Libyan Desert on the east and Tunis on the west (Map: Africa, F 2). The southern part of the country is Fezzan, which has the French Sahara on the west. The country is divided into two governments—the one, Tripolitania, corresponding to the old Vilayet of Tripoli, and the other, Cyrenaica, corresponding to the former Mutessarifat of Bengazi (Barca). The boundaries in the desert are only approximate, and the area of Libya cannot be accurately stated. The estimate in the *Annuario statistico italiano*, published in 1915, is 1,000,000 to 1,500,000 square kilometers (1 square kilometer = 0.3861 square mile). Pop., according to a census taken in 1911, 523,176 natives and about 6000 Europeans.

The interior of Tripoli is elevated and sandy, with fertile spots along the wadies. The country is exposed to the clouds of sand from the deserts. The coasts are mostly low and sandy, with the exception of the northeastern part, where some of the mountains attain an altitude of nearly 2000 feet. Tripoli has no permanent rivers, but there are a considerable number of springs, and the dry river courses fill up during the rainy season. The climate is hot during the summer, but it has more of a Mediterranean than an African character. In its flora and fauna Tripoli resembles the rest of the countries on the northern coast of Africa. Owing to the scarcity of productive land and its small population, Tripoli is very little developed.

Agriculture is carried on only to a limited extent. More attention is paid to stock raising. The chief agricultural products are wheat, dates, grapes, and olives. Sheep are raised on a large scale, and cattle are also to some extent. Some sulphur and salt are obtained near the coast, and there are small sponge fisheries. The commerce was formerly very considerable, and the port of Tripoli was once an important outlet for the products of the interior, with which it is connected by numerous caravan routes. The chief exports are hides, sponges, and henna, besides various articles from the interior of Africa, as gold, ostrich feathers, ivory, rubber, and a few other products. The imports from Europe consist chiefly of manufactures and food substances. The centre of foreign commerce is the city of Tripoli (q.v.). Imports in 1912 were reported at 27,782,000 lire, and exports at 4,029,000 lire.

The Italian Governor of Tripolitania resides at the city of Tripoli, and the Governor of Cyrenaica at the city of Bengazi. The population consists largely of Berbers and Moors, the latter living mostly in the cities. The Turkish element is very limited. Italian is the official language, but Arabic is commonly spoken.

History. Tripoli appears early to have formed a portion of the territory of the Carthaginians. It next passed to the Romans, who included it within the Province of Africa and gave it the name of Regio Syrtica. About the beginning of the third century A.D. it became known as the Regio Tripolitana (on account of its three principal cities, Œa, Sabrata, and Leptis, which were leagued together; whence its present name Tripoli), and was probably raised to the rank of a separate province by Septimius Severus, who was a native of Leptis. Later it passed into possession of the Vandals and Greeks. In the seventh century it was conquered by the Arabs (see BARBARY STATES), and the feeble Christianity of the natives was supplanted by a vigorous and fanatical Mohammedanism. In 1510 the city of Tripoli was captured by Ferdinand the Catholic, from 1530 to 1551 it was in possession of the Knights of St. John. Since 1551 the country had formed part of the Turkish Empire, though the authority of the Sultan, down to 1835, had been virtually at zero for more than a century. During this period Tripoli was a piratical stronghold. In consequence it was attacked by successive expeditions of the English and the French. In 1801-05 it was involved in an unsuccessful war with the United States, and in 1815 an American expedition exacted reparation for injuries done to American commerce. (See BARBARY POWERS, WARS WITH THE.) In 1835 an expedition was dispatched from Constantinople; the ruling bey, Karamanli (in whose family the sovereignty had continued uninterrupted since 1714), was overthrown and imprisoned; a new Turkish pasha, with vice-regal powers, was appointed, and the state made a vilayet of the Ottoman Empire. Several rebellions have since taken place (notably in 1842 and 1844), but they have always been suppressed. In 1911 a war broke out between Italy and Turkey. By the terms of the Treaty of Lausanne Italian sovereignty was recognized in Tripoli, although Italy accepted a clause which permitted the Caliph to exercise religious authority.

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TRIPOLI. The capital of Tripolitania, in Africa, on a promontory in the Mediterranean Sea, which forms a small bay. The Sahara approaches within a short distance (Map: Africa, F 1). The town, whose high walls are dilapidated, lies in a fertile plain. It is typically Oriental with its slender minarets and domed mosques. The castle of the beys is handsome. There is a splendid Roman triumphal arch, erected to Marcus Aurelius. Tripoli owes its importance as the commercial centre of the country to the three historic caravan routes of which it is the terminus. The first of these runs south across the Desert of Sahara to Lake Chad; the second, southwest to Timbuktu; and the third, south by east to Wadai and points in Darfur. The city manufactures carpets, scarfs, and Spanish leather. The harbor varies in depth from 15 to 24 feet. The trade is mostly in the hands of the Jews, who are congregated in a quarter of the town called Harra. Tripoli, one of the oldest cities of Africa, is the Œa of the Phœnicians. In February, 1804, the harbor was the scene of Lieutenant Decatur's brave exploit of recapturing and burning the American frigate *Philadelphia*. Pop., 29,761.

TRIPOLI, trip'ō-lĭ, **TRIPOLIS**, trip'ō-lĭs (the classical name), or **TARABULUS**, tá-rä′ bụ-lụs. A town in Syria, Asiatic Turkey, the capital of a liwa in the Vilayet of Beirut, two and a half miles from El Mina, its port, and 40 miles north-northeast of Beirut (Map: Turkey in Asia, C 3). The streets are well paved and covered in some places by arcades. The houses are built of a porous conglomerate, giving the town a picturesque Oriental aspect. There are 14 churches, nearly equally divided between the Latin, Greek, and Maronite sects, an American mission station and girls' school, an orphanage and girls' home of the French Sisters of Charity, a synagogue, 14 mosques, a monastery of dancing dervishes, a castle, and several large khans. Tripoli is famous for its silk sashes. Silk, sugar cane, ivory, ostrich feathers, wool, and sponges are exported. Mulberry trees are extensively cultivated for the silkworms. The hills east of the town contain numerous tobacco plantations. There is a large overland trade by camels with Aleppo. Pop., 30,000, including El Mina. Of the inhabitants, 24,000 are Moslems, 4500 Orthodox Greeks, 1500 Maronites. Tripoli was a member of the Phœnician League. At that time it lay on the coast. In 450 and in 550 it was destroyed by earthquakes. The Saracens took it in 638. It was several times captured by the Greeks. The Romans erected many fine buildings. After a siege of several years it was taken in 1109 by the Crusaders, under whom it enjoyed great prosperity. Destroyed by the Egyptian Sultan, Kalaun, in 1289, it was rebuilt on its present site.

TRIPOLIS. See TRIPOLITZA; TRIPOLI.

TRIP′OLITE, or **TRIPOLI** (-lī) (from *Tripoli*, in Africa). A name sometimes applied to diatomaceous earth (q.v.), but belonging properly to certain highly siliceous rocks, used chiefly for abrasive purposes. The best known, or Missouri tripoli, is a light, porous siliceous rock, of very fine texture and containing over 98 per cent silica. Consult Ries, *Economic Geology* (3d ed., New York, 1910), and Parr and Williams, *Journal of Industrial and Engineering Chemistry*, vol. i, p. 692 (Easton, Pa., 1909).

TRIPOLITZA, trĕ′pô-lyĕ′tsȧ, or **TRIP′-OLIS**. The capital of the Nomarchy of Arcadia, Greece, 34 miles southwest of Argos, on the Argos-Kalamata Railway (Map: Greece, D 6). It is on a plain, 2000 feet above sea level, near the site of the ancient Tegea and Mantinea. Tapestries and leather goods are manufactured. Pop., 11,000. Tripolitza is a modern city and under the Turkish pashas was the capital of the Morea. It was captured and burned by the Greek patriot Kolokotronis (q.v.), Oct. 5, 1821. In 1825 it was taken by Ibrahim Pasha and completely destroyed by him in 1828.

TRI′POS (from Lat. *tripus*, from Gk. *τρίπους*, *tripous*, tripod). A term peculiar to Cambridge University, denoting the three honor classes composed of successful candidates in the final examinations in the various departments. In mathematics the first-honor men are known as senior and junior wranglers. The term is also used of the examination itself.

TRIP′PANT. In heraldry (q.v.), a term used of a beast of chase represented as walking.

TRIPTOL′EMUS (Lat., from Gk. *Τριπτόλεμος*). A Greek legend, the bestower of grain upon mankind. In the Homeric Hymn to Demeter, Triptolemus is merely one of the princes of Eleusis (q.v.) to whom Demeter (see CERES) teaches her sacred rites when she finally leaves her temple for Olympus. Later, however, tradition made him the son of King Celeus and Meteneira, and a special favorite of Demeter, who gave him a winged chariot, or one drawn by winged dragons, and sent him forth to bear the knowledge of her gift of grain among mankind. This scene is frequently represented on Attic vases of the fifth century and later. Triptolemus had a temple at Eleusis and was honored in Athens also in connection with the two goddesses Demeter and Kore. Attic belief also made him one of the judges in the lower world, apparently in place of Minos, who held an unfavorable place in local legends. The Greek type of Triptolemus was used by the Romans for *Bonus Eventus*, who seems to have had much resemblance to the Eleusinian hero.

TRIP TO SCARBOROUGH, A. A comedy by Sheridan (1777), altered from Vanbrugh's *Relapse* (q.v.).

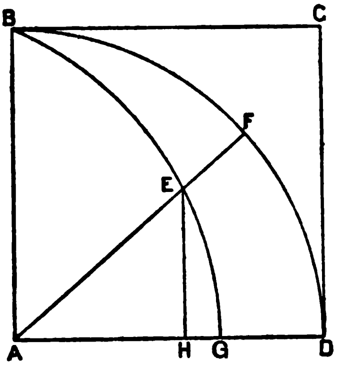
TRIPTYCH, trĭp′tĭk (from Gk. *τρίπτυχος*, *triptychos*, folded thrice, from *τρεῖς*, *treis*, three + *πτυχή*, *ptychē*, fold, from *πτύσσειν*, *ptyssein*, to fold). An altarpiece of three wings, each painted or carved with a distinct subject, but joined together by hinges and capable of being folded so as to present a new face when closed. During the early Middle Age and especially the high Gothic period small ivory triptychs, exquisitely carved, were frequently used in private devotions. During the late Gothic and early Renaissance the triptych was commonly employed as an important devotional altarpiece in the churches of both northern and southern Europe. The panels were of wood, often with architectural framework, and were decorated with paintings. This was especially the case in Flanders and in Germany, where painting was combined with elaborate wood carving in the decorations of altarpieces.

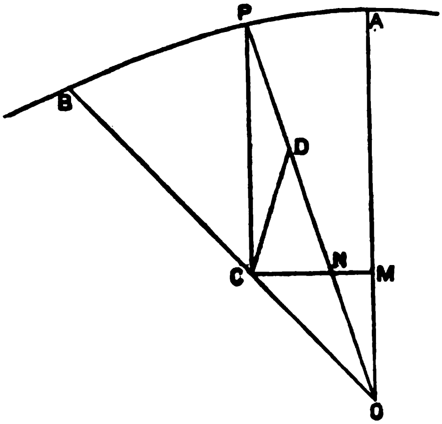
TRI′REME (Lat. *triremis*, galley with three banks of oars, from *tres*, three + *remus*, oar). In ancient times, a galley with three banks of oars; the common form of the ancient ship of war in the fifth and fourth centuries B.C. The credit of the invention was given to the Corinthians, who were said to have used triremes in their war with Corcyra in the seventh century B.C. The details of the structure of the Athenian trireme are still uncertain, as the statements of the ancient writers leave many points obscure, and the testimony of works of art is likewise full of uncertainties. It seems clear that the banks of oars were arranged one above the other, though not perpendicularly; that there was only one man to an oar; and that all the oars could be, and in battle were, used at the same time. For ordinary purposes the crew was, of course, divided into watches. The ancient trireme was of light draft and could be easily hauled on shore, so that a high freeboard seems improbable, for reasons of stability; while the difficulty of keeping an effective stroke with oars of widely different lengths also speaks against any such mode of construction. The trireme was provided with a mainmast which carried a large square sail, that was lowered with its yard, or, if possible, left on shore, before going into action. In the latter case the mast also was unstepped and laid along the deck. There was also a small foremast, which seems to have projected somewhat like a bowsprit and likewise carried a square sail. The Attic trireme of the fourth century carried 170 oars, but probably not over 150 were actually used, the rest being a reserve equipment. Officers, sailors, and 10 or 12 hoplites brought the total crew up to about 200 men. The ship was steered by large paddles on either side of the stern, connected inboard so that they could be handled by a single man. The time was given to the rowers by a special officer, the keleustes. The lowest rank of rowers was called thalamitæ, the second zeugitæ, and the uppermost thranitæ; the thranitæ received the highest pay, as handling the longest oars. In the early battles, such as that at Salamis, the chief endeavor was to lay the ships aboard and fight from the decks, trusting little to manœuvring, in which the Greeks seem to have felt themselves inferior. Later the Athenians developed a high degree of skill in handling their long light vessels and preferred to regard the trireme as the weapon and to aim at disabling or sinking the enemy by the use of the ram, which projected at the water line or below. The attack was aimed at the quarter or side of the hostile ship, and to meet bows on was held unskillful and even dangerous, as the bow was not strongly built. Against the Carthaginians the Romans used boarding bridges in order to neutralize the seamanship of their opponents and bring about a conflict of soldiers.

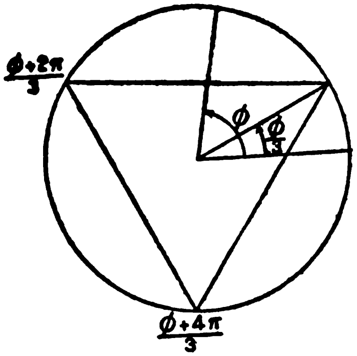
Bibliography. Bernhard Graser, *De Veterum Re Navali* (Berlin, 1864); Paul Serre, *Les marines de guerre de l'antiquité et du moyen-âge* (2 parts, Paris, 1885–91); Arthur Breusing, *Die Nautik der Alten* (Bremen, 1886); id., *Die Lösung des Trierenrätsels* (ib., 1889); Assmann, "Seewesen," in K. A. Baumeister, *Denkmäler des klassischen Altertums* (Munich, 1888); E. Luebeck, *Das Seewesen der Griechen und Römer* (2 parts, Hamburg, 1890–91); the article "Navis" in William Smith, *A Dictionary of Greek and Roman Antiquities*, vol. ii (3d ed., London, 1891); Cecil Torr, *Ancient Ships* (Cambridge, 1894).

TRISAGION, trĭs-ăg′ĭ-ŏn *or* -ā′gĭ-ŏn. See Doxology.

TRISEC′TION OF AN ANGLE (from *trisect*, from Lat. *tres*, three + *sectus*, p.p. of *secare*, to cut). One of the three famous problems of antiquity, the others being the duplication of the cube (q.v.) and the squaring of the circle. (See Circle; Quadrature.) This problem, like the quadrature of the circle, is almost as old as geometry itself, but first received thorough investigation at the hands of the Sophists (400 B.C.). Hippias of this school invented the quadratrix (see Quadrature), by which any angle may be trisected. In the figure BD is a quadrant of a circle, BG is an arc of the quadratrix, and the construction involves the relation $\frac{DB}{FD} = \frac{BA}{EH}$. Hence, by dividing BA into segments having any given ratio, the quadrant or any arc BD can be divided into arcs having the same ratio. If the arc is to be trisected the line corresponding to BA is trisected. The trisection of an angle is also accomplished by means of the conchoid (q.v.) of Nicomedes (180 B.C.). If AOB in the figure is the angle to be trisected, C any point on OB, CM is $\perp$ to OA and CP is $\|$ to OA, it is easily seen that, if P can be found so that $PN = 2CO$, then PO is a trisection line of angle AOB. But the trammel of the conchoid with its directrix resting on CM, parameter $AM = CB = 2CO$, its pole at O, will describe a curve cutting CP in the required point. Many other methods have been devised for the solution of this problem. Viète (1591) showed its relation to the solution of the cubic equation. Gauss (1801) showed its relation to cyclotomic equations. Other mathematicians of the nineteenth century have declared its solution impossible by means of the straight edge and compasses (i.e., by the postulates of Euclidean geometry). But the real reason for the failure of this method to solve the problem and also its associates was set forth by Klein.







The argument may be briefly stated as follows: (1) According to the formula of De Moivre (q.v.) the roots of the equation $x^3 = \cos\phi + i\sin\phi = \operatorname{cis}\phi$, are $x_1 = \operatorname{cis}\frac{\phi}{3}$, $x_2 = \operatorname{cis}\frac{\phi+2\pi}{3}$, $x_3 = \operatorname{cis}\frac{\phi+4\pi}{3}$. (2) These roots are represented geometrically by the vertices of an equilateral triangle inscribed in the unit circle with its centre at the origin. The figure shows that to the root x_1 corresponds the argument $\frac{\phi}{3}$. Hence the equation $x^3 = \cos\phi + i\sin\phi$ is the analytic expression of the problem of the trisection of the angle. No root of the equation can be expressed as a rational function of $\cos\phi$ and $\sin\phi$. That is, the equation is irreducible and can be solved by the aid of a finite number of square roots only for special values of ϕ. Hence the trisection of an arbitrary angle cannot be effected with straight edge and compasses. Consult: Felix Klein, *Famous Problems of Elementary Geometry* (Eng. trans., Boston, 1897); Dickson, "Constructions with Ruler and Compasses," in J. W. A. Young, *Monographs on Topics of Modern Mathematics* (New York, 1911); Arthur Mitzscherling, *Das Problem der Kreisteilung* (Leipzig, 1913).

TRIS'MEGIS'TUS. See HERMETIC.

TRIS'MUS NASCEN'TIUM (Neo-Lat., lockjaw of the new born). A form of lockjaw occurring in newly born children a few days after birth and usually fatal. In some cases the attack comes in 8 or 10 days after birth. The cause is infection of the umbilical stump with tetanus bacilli. See TETANUS.

TRISSINO, três'sē'nô, GIOVANNI GIORGIO (1478–1550). An Italian critic and author, born at Vicenza. Excluded for Imperialistic affiliations from his native territory by the Signoria of Venice in 1509, he spent some time in Germany, at Ferrara, and at Florence, and in 1514 went to Rome, where he was received with favor by Pope Leo X, who sent him on missions to the Emperor Maximilian and to the Signoria of Venice. At the instance of Leo X the ban of proscription was taken off. He enjoyed the esteem of Popes Clement VII and Paul III and passed some time at Venice as Nuncio of the former pontiff. Between 1532 and 1545 he lived at Venice and Padua, maintaining a splendid literary hospitality in his villa at Cricoli. In 1545 he returned to Rome, where he died. Trissino, a man of less than ordinary artistic vision, is an immensely important figure in literary history. His conversations in Florence (1514) gave rise to Machiavelli's *Dialogo intorno alla lingua* and thereafter to the violent polemics of the following decades on the "question of the Italian language." (See ITALIAN LANGUAGE.) His *Epistola* to Clement VII (1527), his *Grammatichetta* and *Dubbj grammaticali* (1529) advocated an orthographical reform of the Italian language (Gk. ϵ = It. open *e*, ω = It. close *o*, ζ = It. sonant *z*, σ = It. sonant *s*, etc.), which he applied to the printing of his own works. By his (the first) edition of Dante's *De vulgari eloquentia* (1523) and in his dialogue *Il castellano* (1528) he propounded the theory of the "Italian Language," before then referred to as "Tuscan," "Florentine," or simply "vulgar," which aimed at the construction of an Italian dictionary and grammar based on a synthesis of the Italian dialects. This theory triumphed in northern Italy, where Trissino's principal follower was Girolamo Muzio.

In literary theory Trissino was an enthusiastic follower of neo-Aristotelian doctrine and an illustrator of the methods of its application to creative work. So his *Italia liberata dai Goti* (1547–48) is the first "regular" epic poem, and his *Sofonisba* (1515) the first regular tragedy in modern literature, though not even this sole distinction of priority clings to his *Simillimi*, based on the *Menæchmi* of Plautus. These works illustrate the Renaissance principles of the unities of time, place, and action, the relations of the episodic to the main themes, the use of the supernatural, of realism in manners and customs, etc. Trissino's selection of the unrhymed hendecasyllabic verse for epic and tragedy was a permanent acquisition for the Italian classic stage; though in the epic it was crowded out by the popular Italian octave stanza used by Pulci, Boiardo, Ariosto, and Tasso. Only an erudite curiosity attaches to Trissino's ideas and experiments in the adaptation of Greek and Latin metres to Italian lyric verse. Consult: *Tuttle le opere di Giovanni Giorgio Trissino* (Verona, 1729); Ciampolini, *La prima tragedia regolare nella letteratura italiana* (Lucca, 1884); Ermini, *L'Italia liberata dai Goti di G. G. T.* (Rome, 1893); Morsolin, *Giangiorgio Trissino, monografia di un gentiluomo letterato del secolo XVI* (2d ed., Florence, 1894); Trabalza, *Storia della grammatica italiana* (Milan, 1908).

TRIST, NICHOLAS PHILIP (1800–74). An American lawyer and diplomatic agent, born at Charlottesville, Va. He was educated at the United States Military Academy, but did not graduate. He studied law under direction of Thomas Jefferson, whose granddaughter he married and of whose household he was a member, but became a clerk in the United States Treasury Department in 1824 and was private secretary to President Jackson in 1829. He was United States Consul at Havana (1834–36) and chief clerk in the Department of State (1845). During the Mexican War, after American successes at Buena Vista and Vera Cruz, President Polk, in April, 1847, appointed Trist special agent to negotiate for peace, but without notifying General Scott. On the arrival of Trist a quarrel ensued between him and Scott. Negotiations were fruitless until after the capture of the city of Mexico and the resignation of Santa Anna as President. The succeeding government desired peace, and Trist, though his powers had been withdrawn, feeling that the wish for peace in the United States would excuse the irregularity, proceeded with the negotiations, by the advice of General Scott, now his friend. The Treaty of Guadalupe Hidalgo was signed Feb. 2, 1848, and was ratified by the United States Senate. Trist afterward practiced law and in 1870 was appointed postmaster at Alexandria, Va.

TRIS'TAN. See TRISTRAM.

TRISTAN DA CUNHA, trĭs-tän' då kōōn'yå. A group of three small volcanic islands in the South Atlantic Ocean, 1500 miles south-southwest of St. Helena and nearly midway between Cape Town and Buenos Aires (Map: World, Eastern Hemisphere, N 20). Total area, 44 square miles. The largest and only inhabited island consists of an extinct volcano 8500 feet high. The climate is equable and healthful. The inhabitants numbered 102 in 1914. They are chiefly the descendants of the British soldiers stationed there during Napoleon's captivity at St. Helena and of settlers from whaling ships. They are supported by agriculture and have a considerable number of cattle. They are also remarkable in having no organized form of government. Access to the outer world is maintained by the annual visit of a British warship.

The islands were discovered in 1506 by the Portuguese navigator Tristan da Cunha and were taken by Great Britain in 1816.

TRISTAN (trĭs′tăn) **UND ISOLDE**, ē-zōl′dĕ. An opera by Wagner (q.v.), first produced in Munich, June 10, 1865; in the United States, Dec. 1, 1886 (New York).

TRISTE′ARIN. See Stearin.

TRIS′TIA (Lat., laments). Five books of short poems, in the elegiac metre, written by Ovid between 9 and 12 A.D. during his banishment at Tomi.

TRIS′TRAM, TRISTREM, or **TRISTAN.** The hero of a Welsh or Armorican romance originally distinct from the Arthurian cycle, but early incorporated with it. Tristram was the son of Roland of Ermonie (or, according to other versions, of Rivalên of north Britain) by Blanchefleur, sister to King Mark of Cornwall. His father slain, his mother dead of grief (which she expressed in the child's very name), Tristram was reared by a faithful steward. At the age of 15 he drifted to the court of his uncle, King Mark, whose favor he won by his skill in the chase and in minstrelsy. He slew in mortal combat Moraunt, or Morôlt, brother of the Queen of Ireland, who had come to demand tribute from King Mark. After suffering for three years from severe wounds he sailed to Ireland, where they were healed by Iseult (variously spelled), daughter of the Queen. On his return to Cornwall, Tristram told his uncle of the marvelous beauty of the Irish princess and was sent back to Ireland to ask her hand in marriage for the King. On the voyage from Ireland to Cornwall, Tristram and Iseult drank of a love potion intended for King Mark and ever after loved each other. Iseult married Mark, but contrived, with the aid of her clever maid, to have many secret interviews with Tristram. At length the lovers were discovered, and Tristram fled to Wales, and later to Brittany, where he married another Iseult, the White-handed, daughter to Duke Florentine; but he never forgot Iseult of Ireland. Desperately wounded, he sent a messenger to Cornwall to summon her to heal him once more. He directed the messenger to hoist a white sail on the return voyage if the princess were on board; if not, a black sail. The Queen of Cornwall hastened to save her lover. As the vessel neared the shores of Brittany, Iseult of the White Hand saw the white sail; but, fired with jealous hate for her rival, she told her husband that the sail was black. Tristram sank back and died. Iseult of Ireland fell prostrate over the body of Tristram and died of a broken heart. King Mark subsequently learned the story of the love potion and buried the lovers in one grave, planting over Iseult a rose and over Tristram a vine, growing so intertwined that no one could separate them.

This passionate story, probably originating, according to Miss Schoepperle, in a Celtic elopement myth, got into literature in the twelfth century and spread through western Europe. Professor Bédier argues that the various versions preserved to us were all derived from one poem probably composed in England by an Anglo-Norman monk. This poem, of which all traces are now lost, was of such beauty that it gave definite form to the Tristram legend. Though this ingenious theory has been the subject of controversy, it is now becoming more universally accepted. The later versions may, however, be traced back to a poem, now existing only in fragments, by an Anglo-Norman trouvère named Béroul (about 1150). A little later than this (about 1160) the theme was treated by Chrestien de Troyes (q.v.) in a poem now lost. So far as has been determined, the source of the many later Tristrams is a very prolix poem by an Anglo-Norman named Thomas (about 1170). Before the close of the twelfth century Tristram and Iseult were among the favorite themes of the troubadours. From the French the romance passed into the German *Tristrant* (about 1175) by Eilhard of Oberge and the *Tristant und Isolde* (between 1200 and 1225) by Gottfried of Strassburg. Gottfried's poem, extending to 19,573 lines, is the most beautiful of all early versions. Left incomplete, it was continued by Ulric of Türheim and by Henry of Freiburg. The great popularity of the romance in Germany is further attested by numerous chapbooks. To the year 1226 belongs a Scandinavian version, *Tristram Saga ok Isondar*, and this in turn was put into Icelandic prose. The earliest extant English version is known as *Sir Tristrem*. The only extant manuscript belongs to the middle of the fifteenth century. It was composed in the last part of the thirteenth century and has been ascribed to Thomas the Rhymer (q.v.). In 1469 was published at Rouen an immense prose *Tristram* in French, which was translated into German, Spanish, and Italian. It was also used by Sir Thomas Malory (q.v.) for his *Morte d'Arthur* (1485). In the nineteenth century Tristram and Iseult became a favorite theme in England and Germany. Following Malory, Tennyson wove the story into the *Idylls of the King* ("The Last Tournament"). In his noble *Tristram and Iseult* Matthew Arnold awakened pity for Iseult of Brittany. But Swinburne in his *Tristram of Lyonesse* best expressed the tremendous passion of the mediæval tale. The theme was treated splendidly by Wagner in his operatic poem *Tristan und Isolde* (1859). Consult the English *Sir Tristrem* as edited by G. P. McNeill for the Scottish Text Society (Edinburgh, 1886), and by E. Kölbing in *Die nordische und die englische Version der Tristansage* (Heilbronn, 1878–82); Golther, *Tristan und Isolde* (Leipzig, 1907); M. W. Austin, *Tristram and Iseult* (Boston, 1905). A charming version of the Tristram story is that of J. Bédier, *Le roman de Tristan et Iseut* (5th ed., Paris, 1902; Eng. trans. by Florence Simmonds, London, 1910, and by Hilaire Belloc, New York, 1914). Other works of importance are E. Muret, *Le roman de Tristan par Béroul* (Paris, 1903); Piquet, *L'Originalité de Gottfried de Strassbourg dans Tristan et Isolde* (Lille, 1905); J. Bédier, *Le roman de Tristan par Thomas* (2 vols., Paris, 1902–05); id., *Les deux poèmes de La folie Tristan* (ib., 1907); W. Hertz, *Tristan und Isolde* (Stuttgart, 1907); Gertrude Schoepperle, *Tristan and Isolt* (2 vols., London, 1913); Passerini, *Il romanzo di Tristano e Isotta bionda* (Milan, 1914).

TRISTRAM, Henry Baker (1822–1906). An English clergyman, traveler, and author, born at Eglingham, Northumberland. He graduated at Lincoln College, Oxford, in 1844 and in 1880 became rural dean of Durham. He traveled extensively in biblical lands and elsewhere and published, among other works: *The Great Sahara* (1860); *Land of Israel* (1865; 2d ed., 1882); *Natural History of the Bible* (1867; 5th ed., 1880); *Bible Places, or Topography of the Holy Land* (1872–97); *Land of Moab* (1873; 2d ed., 1874); *Pathways of Palestine* (2 vols., 1882); *Fauna and Flora of Palestine* (1884); *Eastern Customs in Bible Lands* (1894).

TRISTRAM SHANDY, The Life and Opinions of. A novel by Laurence Sterne in nine volumes (1759–67). The chief interest of the work is in its characters: Walter; Captain Shandy (Uncle Toby), the real hero of the story; Corporal Trim; and Yorick.

TRITHE′MIUS, Johannes (1462–1516). A German Catholic theologian and historian. His name was Heidenberg, but he was called Tritheim or Trithemius from his birthplace, Trittenheim. In 1482 he entered the Benedictine monastery at Sponheim, near Kreuznach, and in 1483 became its abbot. Here he collected a library which made the house famous. His rule was strict, and his monks resented his long absence in the neighboring country; so in 1506 he exchanged Sponheim for the Scottish monastery of St. James at Würzburg, where he died. His writings are very numerous; his sermons to monks were published in 1576, and his letters in 1536. He was also a pioneer author in German Church history and invented a popular system of shorthand, *Steganographia* (Frankfort, 1606; new ed., 1635), for which see Bailey, *John Dee and the Steganographia of Trithemius* (London, 1879). Consult: J. Silbernagel, *J. Trithemius* (2d ed., Landshut, 1868); W. Schneegans, *Abt Johannes Trithemius und Kloster Sponheim* (Kreuznach, 1882); Johannes Janssen, *History of the German People at the Close of the Middle Ages*, vol. i (Eng. trans. by A. M. Christie, London, 1896).

TRI′THING. See Riding.

TRI′TON (Lat., from Gk. Τρίτων). In Greek mythology, a son of Poseidon and Amphitrite, who dwells with his parents in a golden palace at the bottom of the sea. He seems especially connected with Bœotia and was perhaps originally a local divinity of Alalcomenæ or Tanagra. In this region took place the conflict of Hercules with Triton, which was a favorite subject in early works of art. In the fourth century B.C. and later, we find a whole race of Tritons, to be compared with Panes, Sileni, and similar multiplications. In art they are at first human to the breast or waist, ending in the tail of a sea serpent or fish. In later art we find the legs replaced by fishes' tails, or else the figure that of a sea centaur, with the head and trunk of a man, the forelegs and body of a horse, and passing into a serpent with a fish tail. Characteristic is Triton's conch shell, on which he is represented as blowing stormily or gently.

TRITON CONVERTED INTO A WAR TRUMPET.

TRITON. 1. A genus of aquatic amphibians, the newts. (See Newt.) 2. Any of several large gastropod shells, especially a large species (*Triton tritonis*), having a spiral shell more than a foot long, which is used as a war trumpet by natives of the South Sea Islands, the example illustrated being one from the Admiralty Islands.

TRI′TONE (from Gk. τρίτονος, *tritonos*, having three tones, from τρεῖς, *treis*, three + τόνος, *tonos*, tone, sound, tension, strength, cord). In music, a term denoting the augmented fourth which is a succession of three whole tones. as F—B. A progression by the interval of the tritone was strictly forbidden by the older theorists.

TRI′TONID. A sea slug. See Nudibranchiata and accompanying Colored Plate.

TRITYL′ODON (Neo-Lat., from Gk. τρεῖς, *treis*, three + τύλος, *tylos*, knob, knot, callus + ὀδούς, *odous*, tooth). A primitive multituberculate mammal from the lower Jurassic beds of South Africa. In some points it seems to resemble the cynodont reptiles and has been placed by some authorities in that group.

TRI′UMPH (Lat. *triumphus*, OLat. *triumpus*, triumph, victory, shout of joy; of uncertain etymology). The name given in ancient Rome to the highest public honor bestowed on a general who had been successful in war. The victor, after having pronounced a eulogy on the bravery of his soldiers, ascended his triumphal car and passed through the Porta Triumphalis (which probably stood on the Campus Martius), where the Senate met him, and the procession was organized and entered the city, passing by the Via Sacra to the Capitol. First marched the Senate, headed by the magistrates; next came a body of trumpeters; then a train of carriages and frames laden with the spoils of the vanquished; then a body of flute players, followed by the oxen to be sacrificed and the sacrificing priests; then the distinguished captives with bands of inferior prisoners in chains; after them walked the lictors of the imperator, having the fasces wreathed with laurel. Next came the hero of the day—the imperator—in a chariot. He was attired in an embroidered robe and flowered tunic (the *toga picta* and the *tunica palmata;* see Toga). He bore in his right hand a laurel bough, in his left a sceptre, and had his brows garlanded with Delphic laurel. He was accompanied by his children and his intimate friends. His grown-up sons, the legates, tribunes, and equites, rode behind; behind came the rest of the soldiery, singing or jesting at their pleasure, for it was a day of carnival and license. When the procession had reached the foot of the Capitoline Hill, some of the captive chiefs were put to death; the procession, after waiting to hear their death announced, mounted to the temple of Jupiter Capitolinus, where the oxen were sacrificed and the laurel wreath was placed in the lap of Jupiter. In the evening the imperator was publicly feasted, and it was customary to provide him a site for a house at the public expense. Under the Empire generals serving abroad were considered to be the Emperor's lieutenants, and therefore, however successful in their wars, they had no claim to a triumph. They received instead triumphal decorations and other rewards.

The ovation, or lesser triumph (Lat. *ovatio*), differed from the greater chiefly in that the imperator entered the city on foot, clad in the simple *toga prætexta* of a magistrate, and wearing a wreath, not of laurel, but of myrtle; that he bore no sceptre, was not preceded by the Senate and flourish of trumpets, nor followed by his victorious troops, but only by the equites and the populace, and that the ceremonies were concluded by the sacrifice of a sheep instead of a bull, whence, doubtless, the name *ovatio* (from *ovis*, a sheep). Some variations of these ceremonies are found in various authorities and on various monuments.

TRIUMPHAL ARCH. See Arch, Triumphal or Memorial.

TRIUM′VIRATE (Lat. *triumviratus*, union of three men, from *triumvir*, one of a board of three men associated in a public office, from *trium*, gen. pl. of *tres*, three + *vir*, man). The name given in Roman history to the private league entered into between Pompey, Cæsar, and Crassus—the three most powerful men of their time. This compact was not a triumvirate in the proper sense of the term, since it had no legally constituted existence. The term is also applied to the division of government between Octavian (Augustus), Antonius, and Lepidus in the civil wars that followed the murder of Cæsar—an arrangement sanctioned by the Senate. The former is usually called the first, the latter the second triumvirate. Consult Charles Merivale, *The Roman Triumvirates* (new ed., New York, 1889).

TRIVAN'DRUM. A military cantonment and the capital of the native state of Travancore (q.v.), Madras, India, 53 miles southwest of Tinnevelli and about 2 miles from the Arabian Sea (Map: India, C 8). Among the features are the fort with its Maharaja palaces, the temple to Vishnu, the observatory, and the Napier Museum. The Maharaja College here is one of the leading institutions for higher education in India. There are also a Sanskrit college and art and medical schools. Wood carving is the principal industry. Pop., 1911, including cantonment, 63,561.

TRIV'ET (or **TREVET**), Nicholas (c.1258–1328). An English historian, belonging probably to a Somerset family. He is said to have studied at Oxford and at Paris and to have been a Dominican friar in London, becoming eventually the prior of his house. He wrote extensively on theology and Latin literature, but he is chiefly known for his *Annales Sex Regum Angliæ qui a Comitibus Andegavensibus Originem Traxerunt* (ed. by T. Hog for the English Historical Society, 1845). This chronicle history of the Angevins is particularly valuable for the reign of Edward I, the period in which the author flourished. The entire period covered by the *Annales* is from 1136 to 1307.

TRIV'IUM (Lat., meeting of three roads). In the curriculum of the early universities, the first three of the seven liberal arts, which embraced grammar, logic, and rhetoric. See Quadrivium.

TRO'AD. The name of the district in Mysia, Asia Minor, controlled by Troy (q.v.), Priam's city.

TROADES, trō'ȧ-dēz (Lat., from Gk. Τρῳάδες, the Trojan Women). A play by Euripides (455 B.C.), the scene of which is laid at Troy in the Grecian camp, where the captured were allotted to their conquerors.

TROBRIAND, trô'brē'äɴ', (Philippe) Régis (de Keredern) de (1816–97). A Franco-American soldier and writer. He was born near Tours, France; was educated in Paris, Rouen, Tours, and Poictiers; and in 1841 traveled in America. In 1843 he married an American wife and for 10 years lived part of the time in the United States and part in Paris. From 1854 to 1861 he was joint editor of the *Courrier des Etats-Unis*. He entered the Federal army as colonel of the Fifty-fifth New York Volunteers (Guard Lafayette, a French troop) in 1861; took a conspicuous part in the battles of Fredericksburg, Chancellorsville, and Gettysburg; became a brigadier general of volunteers in January, 1864; and commanded a division in Grant's campaign against Lee. He was brevetted major general of volunteers in April, 1865; was commissioned colonel of the Thirty-first Infantry in the regular army in 1866; was brevetted brigadier general of the United States army in 1867, and afterward commanded the districts of Dakota, Montana, and Green River. In January, 1875, he put under arrest the Louisiana Legislature in Governor William P. Kellogg's (q.v.) attempt to keep possession of the State government. (See Louisiana, *History*.) In 1879 he retired from active service. He published *Les gentilshommes de l'ouest*, a novel of the insurrection of 1832 (1841), and *Quatre ans de campagnes à l'armée du Potomac* (1868), which was translated into English in 1889 by Dauchy. Consult *The Life and Memoirs of Comte Régis de Trobriand* (New York, 1910), by his daughter, M. C. Post.

TROCADÉRO, trô'kȧ'dā'rō'. An elevation on the right bank of the Seine, opposite the Pont d'Iéna, named after a Spanish fort near Cadiz taken by the French in 1823. The ground was laid out in terraces for the exhibition of 1867, and for that of 1878 the present Palais du Trocadéro was erected. The building, by Davioud, an immense structure in Oriental style, consists of a central portion flanked by curving wings each 220 yards in length. It contains an immense concert hall, seating 6000; two towers or belvederes; and in the wings a fine museum of casts of French sculpture.

TROCHEE, trō'kē (Lat. *trochæus*, from Gk. τροχαῖος, *trochaios*, trochee, tribrach, running, from τροχός, *trochos*, a running, from τρέχειν, *trechein*, to run). The name of a foot, or measure, in Greek and Latin verse, consisting of a long and a short syllable (— ◡). This rapid measure was employed both in tragedy and in comedy. By analogy the term is used in modern verse to designate a dissyllabic measure consisting of a stressed and an unstressed syllable, e.g.:

When' shall we' three meet' again'?

See Versification.

TROCHELMINTHES, trŏk'ĕl-mĭn'thēz (Wheel Animalcules). A phylum composed of the Rotifera, the Dinophilea, and the Gastrotricha, characterized by having the larva in the form of a trochosphere (q.v.).

TROCHES, trō'kēz. Troches, also called pastilles or lozenges, are small, flattened cakes, consisting of medicinal substances mixed with sugar and mucilage and agreeably flavored. They are intended to be dissolved in the mouth and act locally upon inflammatory conditions of that cavity or the throat. There are nine official troches in the United States Pharmacopœia, as follows: those of tannic acid, ammonium chloride, cubeb, gambir, liquorice and opium, krameria, potassium chlorate, santonin, and sodium bicarbonate.

TROCHILIDÆ, trô-kĭl'ĭ-dē. The family of the hummingbirds (q.v.).

TROCHILUS, trō'kĭ-lŭs. 1. The typical genus of hummingbirds (q.v.), now being supplanted by the name *Archilochus*. 2. The ancient name of a certain plover. See Crocodile Bird.

TROCHOID, trō'koid. See Cycloid.

TROCHOSPHERE, trŏk'ô-sfēr (from Gk. τροχός, *trochos*, wheel + σφαῖρα, *sphaira*, ball, sphere), or Trochosphore. A larval form common to many of the lower invertebrates, which consists of an oval or pearlike body of microscopic minuteness, with a broader and a narrower end and a distinct bilateral symmetry. The body is encircled by a double zone of strong cilia. The mouth, just behind this circlet, leads into an alimentary canal extending towards the small end, where an anal aperture opens. The broader end exhibits sense organs varying in different species in number and character. From this kind of larva the adult forms of the higher groups (many worms, polyzoans, mollusks, etc.) are developed by some sort of true metamorphosis, resulting in an animal utterly different; but in certain very lowly groups, such as the wheel animalcules (Rotifera) and certain closely allied microscopic aquatic forms, no metamorphosis occurs, and the adult may be looked upon as a somewhat modified trochosphere. These groups have therefore been associated by some zoölogists into a phylum termed Trochelminthes. Consult Parker and Haswell, *Text-Book of Zoölogy* (New York, 1910).

TROCHU, trŏ'shụ', Louis Jules (1815–96). A French general, born at Palais, in the Department of Morbihan. After studying in the General Staff Academy he fought, after 1846, with great distinction in Algeria and in 1851 became head of a bureau in the Ministry of War. During the Crimean War he served as aid to Saint-Arnaud and Canrobert, was made a general of brigade, and at Sebastopol distinguished himself in the storming of the Malakov bastion, Sept. 8, 1855. As general of division during the Austro-Italian War of 1859 he did excellent service at Solferino, assuming, after the conclusion of peace, an important post in the War Department. In 1867 he published anonymously *L'Armée française en 1867*, in which he criticized severely the defects in the French army organization, thereby losing favor at court. After the outbreak of the war with Germany he became (August, 1870) Governor of Paris and on the downfall of the Second Empire, after Sedan, was made head of the Government of National Defense, remaining at the same time in command of the military forces of the city. His half-hearted defense of the capital subjected him to bitter criticism, and, when further resistance to the besieging forces had become impossible, he laid down the office of Governor, Jan. 22, 1871, a week before the capitulation of the city. In 1873 he resigned from the army and retired to private life. In defense of his conduct during the siege of Paris he published *L'Empire et la défense de Paris devant le jury de la Seine* (1872); *Pour la vérité et pour la justice* (1873); *La politique et le siège de Paris* (1874).

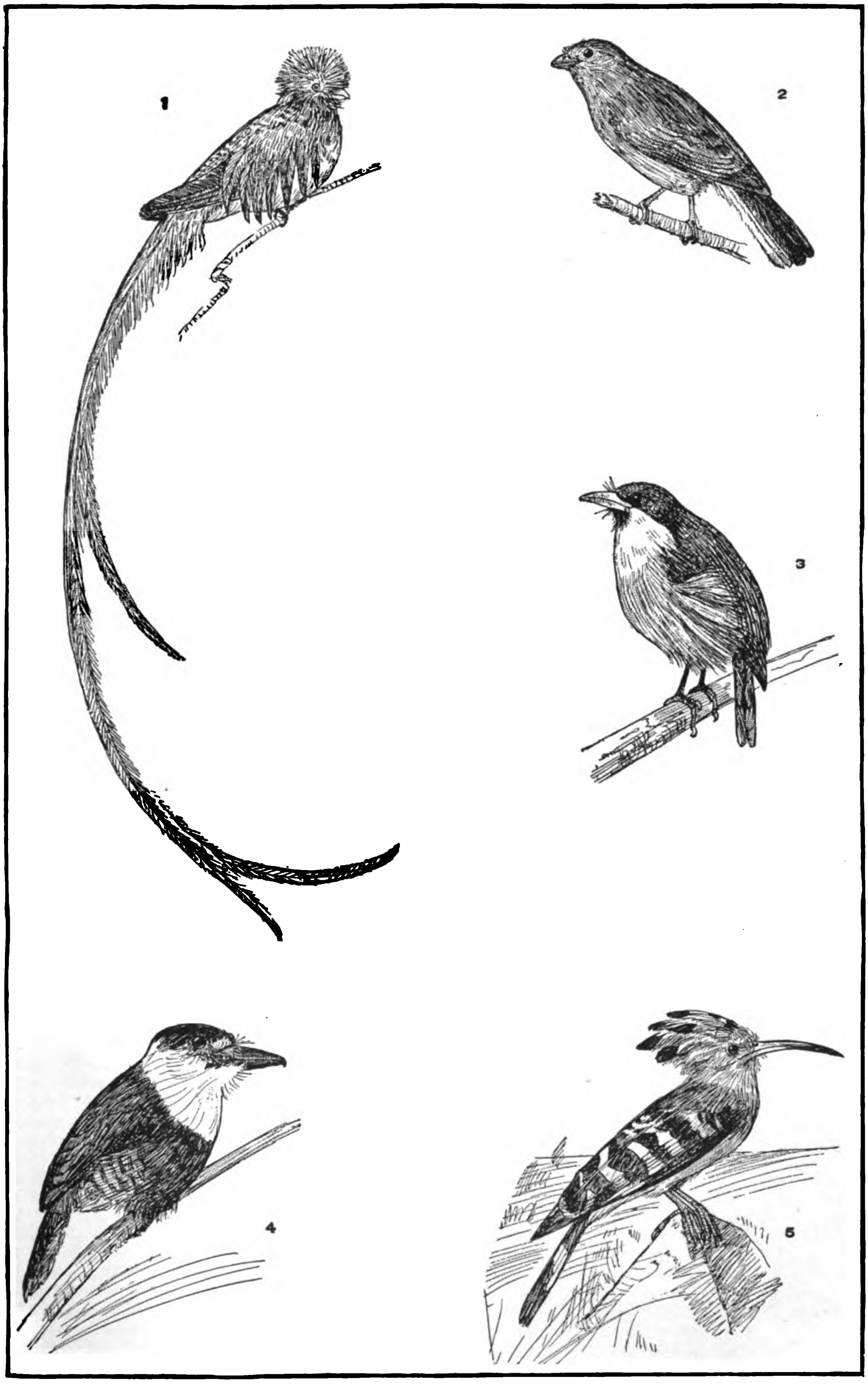
TROELS-LUND, trōls-lụnd, Troels Frederik (1840–). A Danish historian, born in Copenhagen. He took the degree of Ph.D. at Copenhagen University in 1871 and for several years was connected with the Royal Archives. He was professor at the Military School of Frederiksberg (1874–1900). His publications include an important work on Scandinavian history, *Danmarks og Norges Historie i Slutningen af det 16te Aarhundrede* (History of Denmark and Norway at the End of the Sixteenth Century) (14 vols., 1879–1901; in part trans. into Ger.); *Sundhedsbegreberne i Norden i 16de Aarhundrede* (1900); *De tre nordiske Brödrefolk* (1906); *Peder Oxe* (1906); *Historiske Fortællinger, Tider og Tanker* (8 vols.). Troels-Lund's writings, notable for a brilliant narrative style, brought him one-fourth of the Nobel prize in literature for 1915—the others who shared it being Romain Rolland, H. Pontoppidan, and Werner von Heidenstam (qq.v.).

TROELSTRA, trōōl'strȧ, Pieter Jelles (1860–). A Dutch Socialist leader and editor, born at Leeuwarden. He graduated a doctor of laws from the University of Groningen in 1888 and became an attorney in his native city. After he had been employed in various lawsuits in behalf of striking workers, he became editor in 1892 of *De Sneeker Courant*, which in 1893 was removed to Amsterdam under the name *De Nieuwe Tijd*. *De Baanbreker*, founded by Troelstra at Utrecht in 1893, became, as *De Sociaaldemocrata*, the official organ of the Dutch Social Democratic Workers' party. When this party established its daily paper, *Het Volk*, in 1900, Troelstra was made its chief editor. Later he practiced law at Haarlem, but in 1915 retired because of ill health. He wrote: *De Sociaaldemokratische arbeiderspartij in Nederland* (1896; 2d ed., 1899); *Het kiesrecht en de sociaaldemokratie* (1894); *Van leed en strijd* (1898; 2d ed., 1899); *Woorden van vrouwen* (1898); *Het legerwetschandaal* (1901); *Sociaal christendom* (1902); *Theorie en beweging* (1902); *Inzake partijleiding* (1906); *Het kindje* (1909).

TRŒ'ZEN (Lat., from Gk. Τροιζήν, *Troizēn*). An ancient city of Greece in Argolis, about 2 miles from the Saronic Gulf, nearly opposite Calauria. It played some part in Greek legend, being closely associated with Attica, as the birthplace of, Theseus (q.v.), whose mother, Æthra, was daughter of King Pittheus. Here also was localized the story of the fatal love of Phædra (q.v.) for her stepson Hippolytus (q.v.). In historic times it was a Dorian city. During the invasion of Xerxes it took a prominent part in the defense of Greece, sending ships to the Greek fleet and receiving with great kindness the Athenian women and children when driven from their city by the Persian advance. It was later a faithful ally of Sparta during the Peloponnesian and Corinthian wars. Under the Macedonian supremacy it changed masters frequently, now being in the hands of Macedon, again under Sparta, and again brought by Aratus into the Achæan League. In Roman times it seems to have continued to flourish, for Pausanias (q.v.) gives a somewhat detailed account of the objects of interest in the place. The site near the modern village of Damala is marked by few ruins, and excavations undertaken by the French school at Athens have brought to light little beyond the foundations of some large buildings of rather uncertain use.

TROGLODYTES, trŏg'lō-dīts (Lat. *troglodyta*, from Gk. *τρωγλοδύτης*, *trōglodytēs*, cave dweller, one who creeps into holes, from *τρώγλη*, *trōglē*, cave, hole + *δύειν*, *dyein*, to enter, creep into). The name given by the Greeks to tribes or races of uncivilized men, who dwelt either in natural caverns or in holes which they had dug for themselves in the earth. They are mentioned by Strabo as existing as far west as Mauretania and as far east as the Caucasus. Perhaps the best-known troglodytes of ancient times were those of southern Egypt and Ethiopia, where a considerable extent of country was called Regio Troglodytica. According to the Greek accounts they could not speak articulately, but shrieked or screamed like the lower animals. Their chief occupation was herding cattle, and their habits were rude and debased. They are said to have had a community of wives and to have put to

TROGON, HOOPOE, ETC.



1. GREEN TROGON or QUETZAL (Pharomacrus mocinno).
2. LESSER HONEY-GUIDE (indicator minor).
3. YELLOW-THROATED BARBET (Capito Richardsoni).
4. CAYENNE PUFF-BIRD (Bucco Ordi).
5. MADAGASCAR HOOPOE (Upupa marginata).

death the aged and infirm. The name is occasionally applied loosely to any class of cave dwellers (q.v.).

TROGLODYTES. See CHIMPANZEE.

TRO'GON (Neo-Lat., from Gk. *τρώγων*, pres. p. of *τρώγειν*, *trōgein*, to gnaw). A bird of the family Trogonidæ, including about 50 species remarkable for the beauty of their plumage, which is soft, full, and brightly colored. The bill is short, strong, with a wide gape; the tail generally long, in some species very long; the feet small, and frequently feathered almost to the toes. The toes are two in front and two behind, but, unlike all other zygodactylous birds, the reversed toes are the first and second instead of the first and fourth. They are tropical, abounding in South America, but some occur in Asia and a few in Africa. One species, the copper-tailed trogon (*Trogon ambiguus*), is found as far north as the valley of the Rio Grande. It is 11 inches long, bright metallic golden green, throat white, breast and belly carmine, middle tail feathers coppery green, the rest of the tail white and black. The most gorgeous is the quetzal (q.v.). Trogons are usually seen singly or in small flocks and are unsuspicious. They remain most of the time in the thick forest, resting during the heat of the day. The Old World species feed principally on insects, but American trogons eat fruit and also catch insects, crabs, crayfish, small lizards, snails, etc., getting most of this on the wing or by clinging to branches of trees like woodpeckers. Their notes are loud, rather discordant cries, varied by clucking, whistling, and other strange notes. No nest is made, the round whitish eggs being laid in a hole excavated in a rotting tree stub. The group is ancient, as is known by fossil examples, and sufficiently distinct to be ranked as a suborder. Extended accounts of the American trogons are given by Sclater and Salvin in *Biologia Centrali-Americana*, vol. iii (London, 1896). See Plate of TROGON, HOOPOE, ETC.

TRO'GUS POMPE'IUS. A Roman historian of Gallic origin who lived during the reign of Augustus, son of one of Cæsar's secretaries. He was the author of *Historiæ Philippicæ* (in 44 books), a universal history from the time of Ninus, King of Assyria, down to 5 A.D. The original work, which was drawn from some of the best Greek historical writers, is lost, but an epitome of it by Justin (q.v.) is still extant. In addition to the historical narrative the work is said to have contained interesting accounts relating to geography, ethnography, and natural science. Trogus is said to have written several zoölogical and botanical works, based largely on Aristotle and Theophrastus. Consult: A. H. L. Heeren, *Commentationes de Trogi Pompeii ejusque Epitomatoris Justini Fontibus et Auctoritate*, printed in C. H. Frotscher's edition of Justinus (Leipzig, 1827–30); Crohn, *De Trogi apud Antiquos Auctoritate* (Strassburg, 1882); Martin Schanz, *Geschichte der römischen Litteratur*, vol. i, part i (3d ed., Munich, 1911).

TRO'ILUS (Lat., from Gk. Τρωίλος). A son of Priam, or of Apollo, who was slain by Achilles.

TROILUS AND CRES'SIDA. A drama by Shakespeare, probably originally written about 1602 and revised before 1609, when it was printed in two editions. The sources were probably Chaucer, Le Fèvre's *Recuyel of the Histories of Troye*, Lydgate's *Troy-Book*, and perhaps Chapman's *Homer*, partly translated in 1597.

TROIS MOUSQUETAIRES, trwä mụs'ketâr', LES (Fr., The Three Musketeers). A romance by Dumas (1844). The scene is laid in the time of Richelieu, in whose affairs the three famous guardsmen Athos, Porthos, and Aramis and their companion D'Artagnan take part.

TROITSK, trŏ'ĭtsk. A town in the Government of Orenburg, Russia, on the Uya, 394 miles northeast of Orenburg (Map: Russia, K 4). It has a barter court, where an extensive barter trade with the Kirghizes and other tribes is transacted. Pop., 1910, 36,830.

TRO'JAN WAR. A famous legendary war, generally placed about the beginning of the twelfth century B.C.; undertaken by the Greeks for the recovery of Helen, wife of King Menelaus of Sparta, who had been carried off by Paris, son of the Trojan King, Priam. At the marriage of Peleus and Thetis, Eris (Discord), who alone of the gods had not been invited to the wedding, flung among the guests a golden apple inscribed "For the Fairest." This was claimed by Juno, Minerva, and Venus. When the goddesses referred the decision as to which of them was the fairest to Paris, he decided in favor of Aphrodite, thereby securing Helen by her favor and bringing down on the Trojans the lasting wrath of the slighted Juno and Minerva. The expedition to avenge the injury to Menelaus was placed under the command of Agamemnon, King of Argos, and was joined by the Greek heroes, including Achilles, Patroclus, the two Ajaxes, Teucer, Nestor, Odysseus, Diomedes, and Idomeneus. They assembled at Aulis with 100,000 men and 1186 ships and proceeded to Troy, where their demand for the return of Helen was refused. The siege was then begun. It lasted, according to the usual interpretation, 10 years and was terminated only by treachery, when the Greek warriors were introduced into the city in the interior of a great wooden horse. The sack and burning of Troy follow, with the escape of Æneas, whose progeny were to be the founders of Rome. For a very different theory, that the war was in fact a short war, consult B. O. Foster, "The Trojan War Again," in *American Journal of Philology*, vol. xxxvi (Baltimore, 1915).

The story of the war is told in various classical epic poems, of which the *Iliad* is the most famous. (See HOMER.) It terminates with the death of Hector, the principal hero of the Trojans. The *Little Iliad*, ascribed to Lesches of Lesbos, was composed about 660 B.C. (See CYCLIC POETS.) In four books it gave the story of the contest of Odysseus and Ajax, son of Telamon, for the armor of Achilles, the deaths of Ajax, Paris, and Eurypylus, the stealing of the Palladium, and the construction of the wooden horse. At this point the legend was taken up by the *Iliou Persis* or *Sack of Troy*, by Arctinus, in two books, ending with the escape of Polyxena at the tomb of Achilles. The *Nostoi* (Returns), attributed to Agias of Trœzen, in five books, told of the wanderings of Menelaus, Calchas, and Neoptolemus and the murder of Agamemnon. The *Telegonia*, by Eugammon of Cyrene, related various adventures of Odysseus after the slaying of the suitors, his death at the hands of his son Telegonus (q.v.), and the latter's marriage to Penelope.

The legendary history of Troy before the Trojan War, like other Greek myths, varied much in details. It was said that the place owed its name to Ilus, son of Tros, son of Dardanus. Its walls were built by Poseidon for Laomedon, who, however, cheated the god of his promised reward. Hercules rescued Hesione, the daughter of Laomedon, from the sea monster to which she had been exposed, but was likewise cheated by the King, whereupon he and Telamon attacked and captured the city.

The Trojan legend was very popular in the Middle Ages and formed, with the Charlemagne story and the Arthurian traditions, one of the three great divisions into which the work of the French romance writers falls. Celtic legends tell of a certain Brutus who, driven from Troy, founded Brutannia or Britannia. Geoffrey of Monmouth calls him a great-grandson of Æneas. (See Brutus or Brute, The Trojan.) The spread of the legend is due mainly to Benoît de Sainte-More. The gist of the *Iliad* was used in the Latin of Dictys of Crete and by Dares the Phrygian. Benoît knew both Dictys and Dares, but preferred the drier account of the latter, in which the people of the West were reported to descend from the Trojans. This was used about 1200 by Herbart von Fritzlar and about 1250 by Konrad von Würzburg; before 1288 Guido della Colonna had recast it in Latin prose. Benoît's version may also be traced in Boccaccio's *Filostrato* (1344). This is the main source of Chaucer's *Troylus and Cryseyde* (c.1369), as that is of Shakespeare's play. Consult: Dunger, *Die Sage vom trojanischen Kriege in den Bearbeitungen des Mittelalters* (Dresden, 1869); G. E. B. Saintsbury, *The Flourishing of Romance and the Rise of Allegory* (London, 1897). Consult the article "Troïka," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914). See Troy.

TROLLE, trôl′le, Herluf (1516–65). A Danish statesman and admiral, born on the island of Lillö. During the early part of his career he was a statesman and diplomat. He possessed the trust and confidence of the King and in 1559 was appointed inspector of the fleet with the rank of admiral. He applied himself to his new duties with zeal and energy and greatly improved the condition of the navy. In 1563 he succeeded Admiral Peder Skram (q.v.) as commander in chief. In May of that year, with an inferior force, he defeated a powerful Swedish fleet off Oland and captured the Swedish admiral. In August, in an indecisive action, he met a second Swedish force under the celebrated Swedish admiral Klas Horn, and in June, 1565, he again fought Horn at Femern without either side achieving a victory. Trolle, however, was severely wounded and died soon after. When studying at Wittenberg, he became a close friend of Melanchthon. His estate, Herlufsholm, he turned into a school and home for children of nobles and nonnobles alike.

TROLLEY (from *troll*, from OF. *troller*, *trauler*, *troler*, Fr. *trôler*, to ramble, stroll, drag about, probably from MHG., Ger. *trollen*, to roll, run). A word first coined in England and there used in the sense of a handcart and then of a truck. In the United States and Canada it means a sort of grooved metallic sheave or pulley in contact with an overhead electrically charged wire and connected with a rod or flexible conductor to an electric motor on some moving vehicle, such as an electric locomotive or street car, so that the actuating current from the power house may be transmitted, as the trolley rolls on the charged wire. See Electric Railways.

TROLLING, trōl′ĭng. A form of angling. Some trolling is from a moving boat; others troll from the river or lake bank, winding in the bait with the reel or moving it with the rod, and still others troll in the surf, where the current of tides or undertow of the sea carries the bait. If a spinning artificial frog or fish is used, the connection with the line should be made by means of a swivel, to prevent the line from twisting. This is not necessary if the lure is a spoon which revolves without moving the bait. The heaviest fish trolled for in fresh water is the maskinonge, the standard bait for which is a frog alive or imitation, but an effective one is the spoon, preferably showing a golden hue, size No. 8, the feathers at the head of which should be bright scarlet, and a single hook. The bluefish is taken by trolling from a boat in motion or from a stationary boat into the waters around which have been thrown small pieces of menhaden. The Spanish mackerel is taken by trolling, and many other fish of the Atlantic and Pacific and of the Gulf. Off the Florida coast and in the Gulf the tarpon is taken by trolling from a slowly rowed boat. On the California coast the tuna, the yellowtail, and barracuda have been taken on hook. See Angling; Bait Fishing; Fly Casting; Tarpon Fishing.

TROL′LIUS. See Globe Flower.

TROLLOPE, trŏl′lŭp, Anthony (1815–82). An English novelist, born in London, April 24, 1815, son of Frances Trollope (q.v.). Educated at Winchester and at Harrow, he proved a dull scholar, and his poverty made his school days most unhappy. In 1834 he obtained an official position in the General Post Office in London. While there he found time to amuse the public with a series of novels of remarkable merit. His first work to attract attention, *The Warden* (1855), was followed by a continuation entitled *Barchester Towers* (1857), perhaps the most widely read of all his books. In rapid succession came *Dr. Thorne* (1858); *The Three Clerks* (1858); *The Bertrams* (1859); *Castle Richmond* (1860); *Framley Parsonage* (1861); *Orley Farm* (1862); *The Small House at Allington* (1864); *Can you Forgive her?* (1864–65); *The Last Chronicle of Barset* (1867); *Phineas Finn* (1869); *The Eustace Diamonds* (1873); *Phineas Redux* (1874); *The Way we Live now* (1875); *Is he Popenjoy?* (1878); and others. Trollope also published volumes of travel, among them being *North America* (1862), *Australia and New Zealand* (1871–72), and *South Africa* (1878). In biography he wrote a *Life* of Cæsar (1870) and one of Cicero (1880), besides sketches of Thackeray (1879) and Palmerston (1882). His *Autobiography* appeared in 1875–76. He died at Harting, Sussex, Dec. 6, 1882.

Trollope is one of the most admirable of English realists. He delineates the English society of his time with wonderful penetration and with an equal command of humor and of pathos. He particularly excels in depicting life in the cathedral towns, and his portraits of bishops, archdeacons, and the minor clergy are remarkable for their truth and humor. His Mrs. Proudie in *Barchester Towers* and again in *The Last Chronicle of Barset* is perhaps the best of the shrewish type since Shakespeare's Katherine. Very attractive, too, are his young girls, as Lily Dale, Mary Thorne, and Grace Crawley. Trollope did not himself lay any especial claim to psychological insight, yet it would be hard to find in English fiction anything more true and delicate than his analysis of the conscience of Septimus Harding in *The Warden*, or anything more poignant than his study of jealousy in *He Knew he Was Right*. Trollope's snobs, his rustics, and his husband-hunting young women are all drawn with surprising vividness. On the whole, his best work is contained in *The Chronicles of Barsetshire* (13 vols., New York, 1892); yet many of his less read novels, such as *The Way we Live now*, *The American Senator* (1877), and *The Claverings* (1867) are very little inferior. Curious facts concerning his life and methods of composition may be found in his *Autobiography* (New York, 1883). Consult also: Henry James in *Partial Portraits* (New York, 1899); H. T. Peck's Introduction to vol. i of the Royal Edition of Trollope's best-known novels (Philadelphia, 1900); James Bryce, *Studies in Contemporary Biography* (New York, 1903); W. L. Cross, *Development of the English Novel* (new ed., ib., 1905); and for combined criticism and biography, T. H. S. Escott, *Anthony Trollope* (ib., 1913).

TROLLOPE, Edward (1817–93). An English clergyman and antiquary, educated at Eton and Oxford, graduating B.A. from St. Mary Hall in 1839. Ordained priest in the Anglican church (1841), he held various preferments, becoming Bishop of Nottingham in 1877. As secretary and as president of the Associated Architectural Societies, he took an active and judicious part in the work of Church restoration. Among his works are: *Illustrations of Ancient Art, Selected from Objects Discovered at Pompeii and Herculaneum* (1854); *Life of Pope Adrian IV* (1856); *Handbook of the Paintings and Engravings Exhibited at Nottingham, Illustrating the Caroline Civil War* (1864); *Notices of Ancient and Mediæval Labyrinths* (1866).

TROLLOPE, Mrs. Frances (1780–1863). An English novelist and miscellaneous writer, and mother of Anthony Trollope (q.v.), born at Stapleton, near Bristol, March 10, 1780. Her father, William Milton, was subsequently vicar of Heckfield in Hampshire. In 1809 she was married to Thomas Anthony Trollope, a barrister. In 1827 she went to America and during a three years' residence in the United States gathered the materials of her first book, *Domestic Manners of the Americans* (1832). This work attracted great attention, and the severity of certain of its strictures was much resented in the United States, as was natural where the author's tendency towards broad humor magnified vulgarity and left a picture not entirely authentic. Indeed, in 1833 appeared a pamphlet entitled *American Criticisms*. After the death of her husband (1835) Mrs. Trollope had to turn to literature for a living. For 20 years book after book came from her pen. Of her novels perhaps the best were: *The Vicar of Wrexhill* (1837); *The Widow Barnaby* (1838), and the sequels of the latter, *The Widow Married* (1840) and *The Barnabys in America* (1843). Mrs. Trollope's last years were passed in Florence with her eldest son, Thomas Adolphus Trollope (q.v.). She died at Florence, Oct. 6, 1863. *The Domestic Manners of the Americans* was edited by H. T. Peck (New York, 1896). Consult *Frances Trollope*, by her daughter-in-law, Frances Eleanor Trollope (London, 1895).

TROLLOPE, Frances Eleanor. See Trollope, Thomas Adolphus.

TROLLOPE, Thomas Adolphus (1810–92). An English author, born in London, April 29, 1810. His mother was Frances Trollope (q.v.), and Anthony Trollope (q.v.) was a younger brother. He was educated at Winchester and at Oxford. In 1843 he settled at Florence, where his house on the Piazza Maria Antonia became the gathering place of English and American authors traveling in Italy. To his hospitable wife Landor addressed the lines, "To Theodosia." Like his mother and brother, Trollope wielded a ready pen. Not reckoning a prodigious number of articles contributed to newspapers and other periodicals, he published fully 60 volumes; and, it is said, he was always interesting. His most conspicuous works were connected with Italy. Among them are: *Impressions of a Wanderer in Italy, etc.* (1850); *The Girlhood of Catherine de' Medici* (1856); *A Decade of Italian Women* (1859); *Filippo Strozzi: A History of the Last Days of the Old Italian Liberty* (1860); *A Lenten Journey in Umbria and the Marches of Ancona* (1862); *A History of the Commonwealth of Florence to the Fall of the Republic in 1531* (1865); *The Story of the Life of Pius IX* (1877). Trollope also wrote many novels. His last years were passed in England. He died at Clifton, Nov. 11, 1892.

His second wife, Frances Eleanor Trollope, wrote *Black Spirits and White* (1877); *That Unfortunate Marriage* (1888); *Frances Trollope: Her Life and Literary Work* (2 vols., 1895). Consult Trollope's reminiscences under the titles *What I Remembered* (2 vols., London, 1887) and *Further Reminiscences* (ib., 1889).

TROLLS (Icel., Swed. *troll*, troll; connected with Ger. *Droll*, *Troll*, troll, Eng. *droll*). In mythology, misshapen dwarfs. They inhabited hills and mounds, had abnormal thieving propensities, stole children and substituted their own offspring. They were peculiarly sensitive to noise, which was their especial aversion, as it reminded them of the hammer of Thor, which he was accustomed to throw after them. They were called "the hill people." Though strong, they were easily outwitted by men. They had the power to make themselves invisible, to confer health and prosperity, and to foresee the future.

TROM'BONE (It. *trombone*, augmentative of *tromba*, trumpet, probably from OHG. *trumba*, *trumpa*, Ger. *Trommel*, drum; ultimately connected with Eng. *drum*). A musical instrument of the trumpet family, the tones of which are produced by means of a slide mechanism. In its present form it was known as early as the beginning of the sixteenth century. To-day the trombone is made in four different sizes, known as the alto, tenor, bass, and contrabass trombone. The compass of the alto trombone is from A to $e\flat^2$, that of the tenor trombone from E to $b\flat^1$, that of the bass trombone from $_1B$ to f^1, and that of the contrabass trombone from $_1E$ to d^1. Besides this regular compass each trombone is capable of producing seven pedal tones, descending chromatically and beginning a tritone (q.v.) below the lowest tone of the compass of the instrument. The intermediate tones between the highest pedal tone and the lowest regular tone are wanting. The trombones are nontransposing instruments, and the notes all sound as written. Recently trombones have been constructed in which the sliding mechanism is replaced by piston or rotary valves. These instruments permit more rapid execution than the sliding trombones, but are much inferior to the latter in purity of intonation. See Orchestra.

TROMP, trŏmp, Cornelis (1629–91). A Dutch admiral, second son of Martin Tromp. He was born at Rotterdam. As a youth he led a squadron against the Barbary pirates. He became rear admiral in 1653. With Opdam he commanded the Dutch forces in the disastrous battle of Lowestoft (June 13, 1665) and in the rout succeeded in saving a part of the fleet. In June, 1666, he was with De Ruyter in a desperate four days' battle in the Downs against an English fleet under Monk and Prince Rupert, the combat resulting in victory for neither side. In August his conduct in the battle of Dunkirk led De Ruyter to prefer charges against him which caused his removal. When war broke out in 1672 between Holland and the allied English and French, Tromp was restored to his command and fought with consummate bravery on June 7 and 14, 1673, against the combined English and French fleets, under Prince Rupert and D'Estrées, driving the enemy into the Thames. On August 21 a third great battle was fought near the Zealand coast. After the conclusion of peace Charles II made Tromp Baron (1675). Tromp subsequently fought in the employ of the Danes against the Swedes and after De Ruyter's death was made commander in chief of the naval forces of the Dutch. He died May 29, 1691, and was buried at Delft by his father's side.

TROMP, Martin Harpertzoon (incorrectly Van Tromp) (1597–1653). A celebrated Dutch admiral, born at Brielle. He went to sea at a very early age, was made prisoner in an engagement with an English frigate, in which his father was killed, and for more than two years was held in confinement on board an English vessel. For some time after this his history is obscure, but in 1624 he appears as captain of a frigate in the Dutch navy, and in 1637 was made vice admiral. In 1639 he won a brilliant victory over a Spanish fleet off Gravelines in the Strait of Dover, destroying 49 of the enemy's ships with the loss of only one vessel. His greatest fame, however, was gained in the war against England which broke out in 1652. In May of that year he was worsted by Blake and was compelled to yield the command to De Ruyter, but, restored to his post in November, he inflicted a severe defeat on Blake off the Goodwin Sands and for a time was master of the Channel. In February, 1653, while convoying a large merchant fleet through the Channel, he made a gallant running fight against a superior English fleet under Blake, Penn, and Monk. In June he encountered the English in the Channel and was compelled to seek refuge in the Texel, after losing 17 of his ships. In the first days of August he once more took to the sea, and in a battle against the English fleet, under Monk, off Ter Heyde, which raged from August 8 to August 10, he lost 26 of his ships and his life. He was buried at Delft, and a splendid monument marks the grave of the victor in 33 naval combats.

TROMPETER VON SÄKKINGEN, trŏm-pā'tẽr fŏn zĕk'ĭng-en, Der. An opera by Nessler (q.v.), first produced in Leipzig, May 4, 1884; in the United States, Nov. 23, 1887 (New York).

TROMPETER VON SÄKKINGEN, Der (Ger., The Trumpeter of Säkkingen). An extraordinarily popular poem by Joseph Viktor von Scheffel (1853). The story is a legend connected with a seventeenth-century tombstone in the churchyard of Säkkingen which records the death of Werner Kirchhofer, a musician, and Maria Ursula, daughter of the Baron of Säkkingen.

TROMSÖ, trôms'ē. A city on the northwest coast of Norway, in Tromsö Amt (county), and an episcopal city in Tromsö Stift (diocese) (Map: Norway, F 2). Beautifully located on a fertile island, it has magnificent surroundings of well-formed, snow-clad mountains. Owing to the mildness of the Gulf Stream, which sweeps the coast of Norway, its mean temperature is 36.4° F. The vegetation of the island is remarkably luxuriant, and it raises barley and potatoes. It has a town hall, fire department, water works, electric lighting, three hospitals, schools, a seminary for teachers, a navigation school, a school for machinists, an Arctic museum, boat and ship building establishments, fish-oil refineries, net and rope factories, and dairies. All coast steamers call. It engages in very productive fisheries in the Atlantic (near Iceland) and in the Arctic Ocean. Imports are grain, flour, coal, textiles, and salt. The coast scenery, with numerous islands and snow-clad mountains, is wild and beautiful. Tromsö dates from about 1250. Pop., 1910, 7633.

TRONDHJEM, trônd'yĕm, **THRONDHJEM (DRONTHEIM)**. A city of Norway, situated at the mouth of the Nid River, on the south shore of the Trondhjem Fiord, 240 miles north of Christiania (Map: Norway, D 5). Although it is so far north, its climate is remarkably mild, and the fiord never freezes. On one of the surrounding picturesque hills stands the fortress of Christianssten. Another fort is on the small island of Munkholm in the fiord opposite the city, celebrated as the place of imprisonment of the Danish Minister Griffenfeld (q.v.). The town is regularly laid out with wide streets. Many of the houses are built of wood. The principal building is the large cathedral, probably the finest church in Scandinavia. It was founded in the eleventh century over the tomb of St. Olaf and consists of a Gothic nave and choir with a Romanesque transept. It has latterly been restored. Noteworthy also are the arsenal in the old Kongsgaard, the fisheries museum, the leading library, the Stiftsgaard, the theatre, the Art Industry Museum, the museum of the Society of Sciences. The industries are represented by saw mills, wood-pulp factories, fish-curing establishments, machine shops, and shipyards. The commerce is very considerable. It amounts to over $19,315,000 annually, while the shipping in 1913 amounted to 832,400 tons. The chief exports are copper ore from the Röros mines, also iron and pyrites, timber, wood pulp, and fish. Pop., 1901, 38,156; 1910, 44,996. Trondhjem was founded by Olaf Tryggvason, who built a palace there in 997. Its early name was Nidaros. During the Middle Ages it was an important city and a goal of pilgrimage.

TRONEGE, Hagen von. See Hagen, or Hagen von Tronege.

TROOP. See Army Organization; Squadron.

TROOP'IAL (Fr. *troupial*, from *troupe*, troop). A book name for the American hangnests and blackbirds of the family Icteridæ.

TROOST'ITE. See Metallography, *Heat Treatment;* Willemite.

TRO'PACO'CAINE. A drug having the general anæsthetic and mydriatic qualities of cocaine. It is an alkaloid and is extracted from a small-leaved variety of coca, growing in Java. It is used as tropacocaine hydrochloride, and it is said to be more active and less toxic than cocaine.

TROPÆ'OLIN. See Coal-Tar Colors.

TROPÆ'OLUM (Neo-Lat., from Gk. τροπαῖος, *tropaios*, relating to turning or change, from τροπή, *tropē*, a turning, from τρέπειν, *trepein*, to turn), Nasturtium, Indian Cress, Yellow Larkspur. A genus of the family Tropæolaceæ, containing about 50 South American species of beautiful twining or spreading annuals and perennials, producing orange-yellow and sometimes very dark purple or blue flowers in summer. Many are cultivated for ornament upon arbors and trellises. The pickled fruits are sometimes employed as a substitute for capers, and the fleshy rootstock of several species as a human food. The best-known species is *Tropæolum majus*, a climbing or trailing annual in northern climates, long known in the United States as an ornamental plant. Dwarf varieties of this are commonly grown in beds and borders. *Tropæolum minus* resembles the foregoing, but is of weaker growth and produces smaller flowers. *Tropæolum lobbianum*, a native of Colombia, is a vigorous climbing species, of which several beautiful varieties are in cultivation. *Tropæolum peregrinum*, sometimes called canary-bird flower, is grown as an annual in outdoor culture and as a perennial in conservatories. *Tropæolum tuberosum*, which produces scarlet and yellow flowers in the late summer, yields edible tubers, which are used as food in Peru. In northern climates the tubers are taken up in the fall and kept in a dry place during the winter. The annual species are grown from seeds sown in the spring in ordinary garden soil. The perennial species are propagated by the tubers or by cuttings of the young shoots grown under glass or by seeds. The perennials need rich soil and plenty of moisture.

GARDEN NASTURTIUM (*Tropæolum majus*).

TROPE, trōp. A figure of speech. See Rhetoric, Figures of.

TROPHO'NIUS (Lat., from Gk. Τροφώνιος). An ancient god of the earth, worshiped at Livadia in Bœotia, where he had a famous oracle in a subterranean cavern. He who wished to consult the oracle prepared himself by fasting, sacrifices, and purifications in a building dedicated to Tyche (Fortune) and Agathodæmon (Good Luck). A sheep was sacrificed to Agamedes, brother of Trophonius; water from two springs, Forgetfulness and Memory, was drunk; and the consulter descended by a ladder to a vault opening. Through this the feet were inserted, a honey cake to appease the spirits was grasped in each hand, and then some hidden force swept the visitor into the inner recesses, where he saw visions or heard voices, and finally returned feet foremost through the same opening. He was then seated on the stone of Remembrance and questioned by the priests, who interpreted his visions. Legend also told how Agamedes and Trophonius (sons of Erginos and famous early architects) built the temple at Delphi, a treasury for King Hyrieus of Hyria in Bœotia, and other buildings. According to the story, they left a stone loose in the treasury and thus availed themselves of the King's riches at their pleasure. At length Agamedes was caught in a trap, whereupon Trophonius cut off his brother's head and escaped, but at Livadia was swallowed up by the earth. Another version laid the scene with King Augeas in Elis and represented Agamedes as the father of Trophonius and Cercyon. Trophonius cut off his father's head to escape detection and, while Cercyon went to Athens, retired to Bœotia, where he built himself an underground chamber. The same story is told by Herodotus of King Rhampsinitus in Egypt and is a widely diffused folk tale.

TROPHY (OF. *trophee*, Fr. *trophée*, from Lat. *trophæum*, *tropæum*, from Gk. τρόπαιον, *tropaion*, monument of an enemy's defeat, neut. sing. of τροπαῖος, *tropaios*, relating to turning or change). A memorial of victory erected on the spot where the enemy had been turned to flight. Among the Greeks (with the exception of the Macedonians, who erected no trophies) one or two shields and helmets of the routed enemy, placed upon the trunk of a tree, served as the sign and memorial of victory. After a sea fight the trophy consisted of the beaks and stern ornaments of the captured vessels, set up on the nearest coast. It was considered wrong to destroy such a trophy and equally wrong to repair it, when it had fallen down through time, for animosity ought not to be perpetual.

TROPIC (from Lat. *tropicus*, from Gk. τροπικός, *tropikos*, relating to a turn or change, or to the solstice, from τροπή, *tropē*, a turning). One of two parallels of latitude on the terrestrial globe, passing through the most northerly and southerly points on the earth's surface at which the sun can ever be directed overhead. The tropic north of the equator is called the tropic of Cancer, because the sun at the summer solstice (at which time it is vertically over the tropic) enters the constellation of Cancer; and the southern one is, for a similar reason, denominated the tropic of Capricorn. The distance of the tropics from the equator, corresponding to the obliquity of the ecliptic, is about 23½ degrees. They are not absolutely fixed at a uniform distance from the equator, but the limits of their variation are extremely narrow. See Perturbations.

TROPICAL BIG LEG. See Barbados Leg.

TROPIC BIRD, or Boatswain Bird. A seabird of the family Phaëthontidæ, related to the gannets, having long wings and the two central tail quills long and slender. Only three species are known, all tropical, often wandering hundreds of miles from land to hover about vessels. Their flight is graceful, and they capture fish by plunging in the water, often from a great height. They breed upon rocky cliffs, making no nests and laying a single pale-brown, spotted egg. They are nearly helpless on land, and are often caught at their breeding places and robbed of their long tail feathers, prized among savages as decorations. The yellow-billed tropic bird (*Phaëthon flavirostris*) breeds in the Bermudas and West Indies and is white, with black on the wings. The other species belong mainly to the Indian and South Pacific oceans. See Plate of Fishing Birds.

TROPISM (from *trope*, from Gk. *τροπή*, *tropē*, a turning). The act of turning towards or being oriented by the stimulus of light, gravity, wind, food, and so on. Thus, heliotropism, the first to be used of the many terms ending in tropism, means turning to the light. At first the term was restricted to such plants as the sunflower, which turns after or follows the sun, owing to the stimulus of the sun's rays. It was then found that animals were heliotropic, and further studies on the acts of animals in response to different physical stimuli have resulted in a somewhat extensive nomenclature. Tropism may be positive or negative. Certain plants, as plasmodia, and animals, as the sea cucumber, the starfish, and even the lady beetle, which are positively geotropic, are forced when on vertical surfaces to crawl upward; this is negative geotropism. The investigation of tropism has most important bearings on comparative psychology and the explanation of instinctive acts.

Anemotropism. An orientation of the body with respect to the wind, seen in flies (*Bibio ophyra*, etc.), which poise in swarms in the air, heading directly towards the wind, all the swarms of a given locality oriented in the same direction like weathercocks. On the other hand, the locusts move with the wind and head away from it, i.e., they are negatively anemotropic. (Wheeler.)

Chemotropism. The orientation of an organism by molecules emanating from a centre of diffusion. As the name indicates, it means response to odors or tastes emanating from food, decaying substances, and other matters. Thus, the maggot of the flesh and other flies are positively chemotropic towards certain chemical substances formed in decaying meat and cheese. The female fly is led not so much by a special instinct to these substances as by the stimulus of the rank smelling meat. As soon, says Loeb, as the fly is seated on the meat chemical stimuli seem to throw into activity the muscles concerned in egg laying and the eggs are deposited on the meat. Negative chemotropism is forcibly illustrated by the use of the oil of pennyroyal, of tobacco smoke, or kerosene oil in driving away flies and mosquitoes. For the botanical aspect of this tropism, see Chemotropism.

Galvanotropism. When certain shrimps, crayfish, and salamanders are subjected to the effect of a galvanic current, such changes of tension take place in the muscles of the appendages that movement towards the anode becomes easier and towards the cathode more difficult. The result is, says Loeb, that if the current is continued long enough all the animals collect at the positive pole. It differs from heliotropism chiefly in that the curves of the current take the place of the rays of light.

Geotropism. As the result of the action of gravity, plants and certain animals tend to descend into or towards the earth. The act of righting in a starfish or sea urchin, or in a polyp (sea anemone), is the result of geotropic irritability, i.e., of positive geotropism. The effects of geotropism are seen in any moth or butterfly which has just emerged from the pupa case. It is restless till it finds a perpendicular surface on which to support itself with its abdomen hanging down until the wings are fully expanded. A fly orients its body head downward, a position assumed by many web-weaving spiders. Geotropism plays a part in the depth migrations of pelagic animals. See also Geotropism in Plants.

Heliotropism or Phototropism. Originally applied to the property certain plants possess of turning to the light. It has been found that many animals also are oriented towards the light. Loeb claims that in the case of animals which possess nerves "the movements of orientation towards light are governed by exactly the same external conditions and depend in the same way upon the external form of the body, as in the case of plants which possess no nerves." Many young or larval pelagic animals undergo periodic depth migrations. They begin to migrate vertically upward towards the surface of the ocean in the evening, descending in the morning, but since they never sink beyond a depth of about 1200 feet below, where light does not penetrate, this fact suggests that the light is the controlling power in their depth migrations. Loeb finds that the free-swimming animals at the surface of the sea are all permanently or for a short period positively heliotropic. There is a negative as well as a positive heliotropism. If light strikes one side of a positively heliotropic animal, an increase takes place in the tension of those muscles which turn the head to the source of light, while in the negatively heliotropic animal under the influence of one-sided illumination a decrease takes place in the tension of the same muscles, with the result that the negatively heliotropic animal is forced to move away from the source of light. The flight of moths towards a light is a case of heliotropism. Being a rapid flyer, the moth gets into the flame before the heat can check it. See Phototaxis. For heliotropism in plants, see Heliotropism.

Paraheliotropism. This is defined by Darwin as the movement by which some leaves temporarily direct their edges to the source of light. See Paraheliotropism.

Hydrotropism. If a king crab is placed on shore a few feet from the water's edge, it will seek the water, perhaps oriented by the moisture not far away. Ants exhibit a reaction to heat (thermotropism) and also hydrotropism, in the care with which they move the eggs, young, and old larvæ and pupæ, as the nest becomes too warm or cold, moist or dry, at different times. For the influence of water on plants, see Hydrotropism.

Rheotropism. This is illustrated by the action of fish in heading up stream and by the slime protozoan in creeping against the current. For its botanical aspects, see Rheotropism.

Stereotropism or Thigmotropism. This form of tropism is contact irritability, which forces the animal to bring the ventral side of the body in contact with solid bodies. Thus, the ventral side of the starfish is positively stereotropic; in other words, the starfish, off the bottom, becomes restless if its ambulacral feet are not in contact with solid bodies. If earthworms are placed in a transparent closed vessel, they appear to be positively stereotropic. As soon, says Loeb, as they reach an angle in the aquarium they remain there, crawling along where the glass can touch them on two sides. This form of tropism plays, says Loeb, a very important part in the processes of pairing and in the formation of organs. The tendency of many animals to creep into cracks and crevices has, he claims, "nothing to do with self-concealment, but only with the necessity of bringing the body on every side in contact with solid bodies." The eel is positively stereotropic. It is forced to bring every part of its body, as far as possible, in contact with solid bodies. All the surface of the eel's body is stereotropic, and if touched with the finger on one side there result positively stereotropic curvatures towards the finger. There is in such an act no more consciousness than in the boring of a root in the sand. (Loeb.) Stereotropism is called thigmotropism or thigmotaxis by some authors. Another form of tropism is traumatotropism.

Consult Jacques Loeb, *Introduction to Comparative Physiology of the Brain and Comparative Psychology* (New York, 1900); also Wheeler, "Anemotropism and Other Tropisms in Insects," in *Archiv für Entwickelungsmechanik der Organismen*, vol. viii (Leipzig, 1899).

TROPPAU, trŏp′pou. The capital of Austrian Silesia, on the right bank of the Oppa, 37 miles northeast of Olmütz (Map: Austria, F 2). It has a Gothic church, a castle, a library of 43,000 volumes, and a museum of natural history and antiquities; also the Franz-Josef Museum of art and industry, the provincial insane asylum, etc. Troppau manufactures large quantities of cloth for army use; also stoves, machines, jute, etc. It was founded in the thirteenth century. At Troppau, in the fall and winter of 1820, a congress of European monarchs assembled for the purpose of dealing with the revolutionary disturbances in Italy. It was one of the series of European congresses which under the inspiration of Metternich (q.v.) sought to check the spread of liberal ideas and to carry out the policy of the Holy Alliance (q.v.). Pop., 1900, 26,725; 1910, 30,762.

TROSSACHS, trŏs′ăks. A picturesque and well-wooded valley in Perthshire, Scotland, between Lochs Acray and Katrine, 8 miles southwest of Callander, amid hills rising from 1851 feet to 2390 feet in height (Map: Scotland, D 3). It has been a great tourist resort since its immortalization by Sir Walter Scott in *The Lady of the Lake* and *Rob Roy*.

TROTTING (from *trot*, from OF., Fr. *trotter*, probably from OHG. *trottōn*, to tread, MHG. *trotten*, to run, frequentative of OHG. *tretan*, Ger. *treten*, to tread, step). A gait of the horse. Notwithstanding that the foundation of America's trotting stock came from England, and that in Russia there are the celebrated Orloff trotters and another breed in Norway, the trotting racer of to-day is distinctly the product of America. The gait was known to the ancients, but was abominated by them. Trotting was a favorite gait among the English sportsmen of Suffolk and Lincolnshire at the end of the eighteenth century, and a special breed there performed wonders; Locksmith's Gray trotted 72 miles in 6 hours in 1762. Ten years later, a Lincolnshire horse trotted 30 miles in 2h. 10m., with a rider weighing 220 pounds, and Phenomenon 17 miles in 53m. Yet as an historical fact American trotters owe nothing to these fast English trotters, but everything to the thoroughbred. The modern trotter may be traced back to Messenger, who was imported in 1788 by Thomas Benger, of Bristol, Pa. His father was Blaze, his grandsire Flying Childers, his great-grandsire the Darley Barb. His mother's father was Turf, who was directly descended from the Godolphin Barb. So on both sides of his pedigree Messenger brought the most select thoroughbred blood into America. He was a running-bred horse, yet from him the American trotter derives its dominant characteristics—the grit of the Arab, the gentleness of the Barb, and the hardy endurance of the English thoroughbred. The Hambletonians, comprising 90 per cent of the American trotters, are derived from Messenger on both sides through Rysdyk's Hambletonian, Abdallah, and Mambrino Messenger. Hambletonian's dam was the Charles Kent mare, the daughter of One Eye, and granddaughter of Silver Tail, who was the daughter of Messenger. Hambletonian's family includes Dexter, 2m. 17½s.; Goldsmith's Maid, 2m. 14s.; Rarus, 2m. 13¾s.; Saint-Julien, 2m. 11¼s.; Jay Eye See, 2m. 10s.; Maud S., 2m. 8¾s.; Sunol, 2m. 8¼s.; Nancy Hanks, 2m. 4s.; Alix, 2m. 3¾s.; and Directum, 2m. 5¼s. The second great trotting family, the Mambrinos, great for racing quality and beauty, is derived on the father's side from Messenger and on the mother's side from imported Paymaster. The mingling of the blood of the Hambletonians and Mambrino Chief has resulted in such ideal trotters as Azota, 2m. 4¾s., and Cresceus, 2m. 2¼s. The founder of the Clay family was Young Bashaw, by Grand Bashaw, an imported Barb, but on the female side are Messenger's progeny. The Star family, too, on the mother's side came from the same horse.

In the early trotting days colts were never trained; only matured horses raced, and they were capable of feats of endurance which no modern horse is or could be called upon to perform. Fanny Jenks in 1845 trotted 101 miles in 9h. 57m., drawing a sulky weighing 150 pounds. Lady Suffolk beat Dutchman two three-mile heats in 1m. 40½s. and 7m. 56s. respectively, and she trotted her fastest mile when 12 years old. Goldsmith's Maid trotted a mile in 2m. 14½s. when she was 17 years old. She started 118 times and beat 2m. 30s. in 115 of them, and Maud S. made her then world's record, 2m. 8¾s., when she was 11 years old. These times, too, were all before the days of the kite-shaped tracks, banked and rolled with scientific nicety, and long before the rubber-tired wheel sulky, both of which inventions have helped to reduce the mile record. On Aug. 17, 1903, at the Brighton Beach (N. Y.) track, the trotting record was reduced by J. K. Billings's Lou Dillon to 2m., but in October of the same year Lou Dillon still further reduced the record to 1m. 58½s. Weather conditions were unfavorable, but the mare had the advantage of two pacemakers, one drawing a wire-net guard acting as a wind shield. This form of record making is protested by many authorities, who claim that such time should be recorded separately. In 1916 the world's record for trotting 1 mile was 1m. 58s., done (against time) by Uhlan at Lexington, Ky., Oct. 8, 1912.

For pleasure driving and friendly road competitions a light wagon was in use as early as 1786, but not until after that did the trotter as a racer become prominent. In that year Boston Blue trotted a mile in little less than 3m. By 1825 the New York Trotting Club was formed, and dashes of speed were daily indulged in on what is now Third Avenue, from the Bull's Head to Harlem. Up to 1898, however, the great bulk of the trotting of the country was done on tracks, 2000 of which were scattered over the continent. These tracks on which regular races are held are either exactly 1 mile or ½ mile from start to finish, and a horse must win two heats to win the race. The courses are in the main elliptical, though some, built after 1890, are kite-shaped.

Since 1898 a great impetus has been given to trotting competitions by the creation of civic speedways, the first of which was constructed by the municipality of New York, along the banks of the Harlem River, from 155th Street to Fort George. Many great cities throughout the country have followed the example. For bibliography, see references under Horse Racing.

TROTWOOD, Betsy. In Dickens's *David Copperfield*, the hero's great-aunt, eccentric but good-hearted.

TROTYL. See Trinitrotoluenes.

TROTZENDORF, trŏts'en-dôrf, Valentin. See Friedland, Valentin.

TROUBADOURS, tro͞o'bȧ-do͞orz (Fr. *troubadour*, from Prov. *trobador*, troubadour, from *trobar*, OF. *trover*, *trouver*, Fr. *trouver*, to find, compose). The mediæval poets of southern France from about 1100 to about 1400, singers of war and love, whose wandering lives, full of passion and adventure, have made them typical romantic figures of their age. The feudal conditions of the region to which they belonged were favorable to the development of the wandering minstrel. Society was divided into three classes, commons, clergy, and nobles, the nobles alone possessing either means or desire liberally to reward literary and musical skill. The nobility, moreover, consisted of many petty independent barons, who tended to attach themselves to powerful local houses, such as that of the counts of Toulouse. There were, therefore, many courts, not too far distant from each other, to which troubadours could resort. Another social condition which had an important influence upon the character of Provençal poetry was the position of noble ladies. They received fiefs (by inheritance or as dowry), and they even governed and presided over a court. Usually married young and for social and political reasons rather than for love, they became queens of society, objects of fervent passion or conventional adoration.

With the accumulation of wealth and the progress of refinement, delight in life became conspicuous. The love of splendor manifested itself in gorgeousness of dress and magnificence of entertainments. Prodigality was the fashion. The ideal prince was he who bestowed gifts lavishly. In addition to the chase and the tourney, a favorite amusement was song—supplied by the jongleurs and troubadours. The jongleurs (*joculatores*) were the successors of the Latin *mimi*. They wandered from town to town, from castle to castle, supplying amusement to the commons at fairs and in market places and to the higher classes at their feasts. The meaner kind not only recited, sang, and played on musical instruments, but performed as jugglers, dancers, acrobats, and exhibitors of trained animals. Members of this class were also to be found in the following of every great lord, among his permanent domestic servants or *ministeriales*. They were court minstrels and entertainers.

From such singers sprang the troubadours. It may be said that the jongleur was one who made a trade of poetry and music; the troubadour one who devoted himself to the production of artistic court poetry, whether for gain or not. The jongleurs were therefore always poor, either by origin or by fate, whereas the troubadours, though largely belonging to the humble or the middle class, included knights, barons, counts, and even kings.

The troubadours led a wandering life, though they often lingered for years at the court of some patron, praising the mistress in extravagant terms and supporting the policy of the master by vigorous exhortations to his friends or by bitter denunciation of his enemies. War and courtly service were their chief themes. (See Provençal Literature.) Conventional as this poetry was, there were no schools in which the art was taught. Each troubadour learned from his predecessors and handed down the tradition. Even the art of writing was not necessary, for the pieces were prepared chiefly for hearers. They were usually sung by the composer to his own accompaniment, but those who could not sing taught words and music to their jongleurs. By this method a wider audience was reached than the individual author could obtain. Whenever a lyric was sent to some friend at a distance it was not intrusted to writing, but to the voice of a messenger. This poetry, therefore, required a pleasure-loving aristocracy for its audience and wealthy and generous patrons for its support. It mirrored the soul of chivalry, an ideal of heroism, generosity, courtesy, and love. For flattering the vanity of the nobles and lending his talent to their taste for pleasure, the singer was rewarded with gifts of money, weapons, horses, or garments. Generosity was naturally praised as the chief of princely virtues, and growing avarice was a sign of the hopeless degeneracy of the times. Richard Cœur de Lion was considered the mirror of knighthood, and the practical statesmanship of Philip Augustus of France was judged low and unworthy. With the disappearance of the society they represented, the troubadours vanished.

The first troubadour whose lyrics have been preserved was William IX, Count of Poitou and Duke of Aquitaine, but he must have had a long line of humble forerunners. His granddaughter, Eleanor, the quick-witted but licentious wife of Louis VII and Henry Plantagenet, was the theme of the impassioned songs of Bernart de Ventadour. Ermengarde of Narbonne was another celebrated patroness of poetry, with many adorers in verse—this was their flourishing period. Among their chief patrons were the counts of Provence, the counts of Toulouse, and several kings of Aragon and Castile, the most notable of whom was Alfonso II of Aragon. In Italy the lords of Este and the Emperor Frederick II harbored the singers of Languedoc. At these courts minstrels were kindly received and lavishly rewarded, taking part apparently in the social pleasures mirrored in their songs.

Much of the romantic interest that has gathered about the careers of these poets is derived from the Provençal biographies and *razos* which are found in some of the manuscripts containing their works. Many of these are merely imaginative tales in which elements of folklore, combined with a fanciful interpretation of the poems, have been set down as fact. Growing up among the later jongleurs and other lovers of poetry, they represent the conception which the succeeding age had formed of the heroes of Provençal song. Another fact has tended to give a romantic coloring to the lives of the troubadours: the fact that their poems deal so largely with the subject of love. This love was, it is true, chiefly factitious and conventional rather than personal, and the formulas in which it was expressed are exceedingly monotonous; but the modern imagination has built up for these wandering minstrels a sort of butterfly existence of poetry and passion, with the added excitement of constant adventures.

Bibliography. Eugène Baret, *Les troubadours et leur influence sur la littérature du midi de l'Europe* (3d ed., Paris, 1867); Paul Meyer, *Les derniers troubadours de la Provence* (ib., 1871); John Rutherford, *The Troubadours: Their Loves and their Lyrics* (London, 1873); Francis Hueffer, *The Troubadours: A History of Provençal Life and Literature in the Middle Ages* (ib., 1878); Manuel Milá y Fontanels, *De los trovadores en España* (2d ed., Barcelona, 1889); Jules Arnoux, *Les troubadours et les félibres du midi* (Paris, 1889); J. F. Rowbotham, *The Troubadours and the Courts of Love*, in "Social England" series (London, 1895); Ida Farnell, *Lives of the Troubadours, Translated from the Mediæval Provençal* (ib., 1896); J. H. Smith, *The Troubadours at Home* (2 vols., New York, 1899); Joseph Anglade, *Les troubadours: Leurs vies, leurs œuvres, leur influence* (Paris, 1908); H. J. Chaytor, *The Troubadour*, in "Cambridge Manuals of Science and Literature" (Cambridge, 1912); Giulio Bertoni, *I trovatori d' Italia: biografici, esti, traduzioni, note* (Modena, 1915), containing a bibliography; also H. J. Chaytor, *The Troubadours of Dante: Being Selections from the Works of the Provençal Poets Quoted by Dante* (Oxford, 1902); and for the music: Pierre Aubry, *Trouvères et troubadours* (2d ed., Paris, 1910), with music; J. B. Beck, *La musique des troubadours* (ib., 1910); also references under PROVENÇAL LITERATURE.

TROUBAT, trōō'bȧ', JULES SIMON (1836–1914). A French littérateur, born at Montpellier. He was the last secretary of Sainte-Beuve (q.v.), one of his testamentary executors, and his legatee. He published a number of posthumous works of Sainte-Beuve, such as his *Correspondance*, an unfinished monograph on Proudhon, and three volumes of articles originally contributed to the *Premiers lundis*. Troubat himself wrote: *Souvenirs et indiscrétions* (1875); *Notes et pensées* (1888); *Souvenirs du dernier secrétaire de Sainte-Beuve* (1890); *Essais critiques* (1902); *Sainte-Beuve intime et familier* (1903); *Souvenirs sur Champfleury et le réalisme* (1905).

TROUBETZ'KOY, AMÉLIE RIVES, PRINCESS. See RIVES, AMÉLIE.

TROUBETZKOY, PRINCE PAUL (1866–). A Russian sculptor. He was born at Intra, Lago Maggiore, Italy, son of a Russian nobleman who had married an American (Miss Winans). After desultory study under Ernesto Bazzaro, at the Brera in Milan, he worked independently, and in 1894 won recognition with his "Indian Scout" now in the Gallery of Modern Art, Rome. In 1897 he removed to Moscow, where he was appointed professor of sculpture at the Academy, and where he modeled several busts of Russian notables, an equestrian portrait of Tolstoy (1899, Luxembourg Museum, Paris), a seated figure of Prince Leon Golitzin, and statuettes of Grand Duchess Serge, Grand Duke Andre Vladimirovitch, and Count Witte. From 1905 Troubetzkoy lived in Paris. His art is very modern in treatment and technique, with a decided impressionistic effect. The subject matter is handled with originality and refreshing spontaneity; but the surfaces are sketchy and unfinished. Troubetzkoy is represented in many European galleries, and in that of San Francisco. His later works include: portraits of Giovanni Segantini (Berlin Museum), Auguste Rodin, Joaquin Sorolla (Hispanic Society, New York), George Bernard Shaw, Anatole France, Signor Giulio Savarese, and Paul Helleu; the equestrian monument to Alexander III (1909, St. Petersburg), and the "Daughter of Prince Scipione Borghese on Horseback" (1908). He also executed many charming genre statuette groups of children, dogs, etc. Among other honors, he was awarded gold medals at Rome, Dresden, Paris (1900), and Berlin. A representative exhibition of his sculptures was held at the Hispanic Society in New York in 1911. His brother, PRINCE PIERRE TROUBETZKOY, made New York his residence and became known as a portrait painter.

TROUESSART, trōō'ĕ-sȧr', EDOUARD LOUIS (1842–). A French zoölogist, born at Angers, and educated at the University of Paris (M.D., 1870). He was a surgeon in the French army (1870–71); professor at Angers (1882); director of the Natural History Museum of Angers (1882–85), and thereafter professor of zoölogy at the Natural History Museum in Paris. He published *Sur les mammifères vivants et fossiles* (1879–1907); *Mémoires sur les Acariens parasites et les Acariens marins* (1880–1907); *Les microbes, les ferments, et les moisissures* (1886; Eng. trans., 1886); *La Géographie zoologique* (1890); *Faune des mammifères de France* (1885); *Les parasites des habitations humaines et des denrées alimentaires* (1895); *Catalogue des mammifères vivants et fossiles* (1898–1904). Trouessart also collaborated on *La Grande Encyclopédie* (1885–1899). He was laureate of the Société entomologique (1895).

TROUP, trōōp, GEORGE MCINTOSH (1780–1856). An American politician, born in the present Washington County, Ala. He graduated at the College of New Jersey (Princeton) in 1797, was admitted to the bar in 1800, and practiced in Savannah. From 1801 to 1804 he was a member of the Georgia Legislature; was a member of the United States House of Representatives from 1807 to 1815; was chairman of the Military Committee during the War of 1812, and opposed vigorously the Yazoo compromise. From 1816 to 1818 he was in the United States Senate, and from 1823 to 1827 was Governor of Georgia. During the dispute which arose between the agents of the general government and the State in regard to the extinguishment of the Creek title to lands in Georgia, he did not hesitate to defy the Federal government. From 1829 to 1833 he was again a member of the United States Senate. He was a strong defender of States' rights, and in 1833 presided over the Georgia States' Rights Convention.

TROUPIAL, tro͞op'ĭ-*a*l. See Oriole.

TROUS-DE-LOUP, tro͞o'd*e*-lo͞o, or Military Pits. Excavations in the shape of an inverted truncated cone or pyramid, with a pointed stake in the bottom. They should not be so deep as to afford cover to the enemy's skirmisher. Two and one-half feet or less is a suitable depth. They are usually dug in 3 or 5 rows and the earth thrown to the front to form a glacis. The rear row is dug first and then the next in front, and so on, so that no earth is cast over the finished pits. An excellent arrangement is to dig the pits in a checkerboard plan, leaving alternate squares and placing a stake in each of them to form a wire entanglement. One man can make 5 pits on a 2-hour relief. Such pits, placed as obstacles in front of defensive positions, may interfere seriously with the advance of infantry, and are not susceptible of destruction by artillery fire. Consult *Engineer Field Manual United States Army* (Washington, Government Printing Office, 1909).

TROUSSEAU, tro͞o'sō', Armand (1801-67). A French physician, born at Tours. He became M.D. at Paris in 1825, and after holding other similar posts became professor at the Hôtel Dieu in 1852. Four years later he was elected a member of the Academy of Medicine. Trousseau is best known through his use of tracheotomy in croup: *Nouvelles recherches sur la trachéotomie pratique dans la période extrême du croup* (1851). Among his works are best known: *Traité de thérapeutique et de matière médicale* (1826-37; 8th ed., 1870; Eng. trans., 1842), with H. Pidoux; and *Traité pratique de la phthisie laryngée* (1837; Eng. trans., 1839), for which classical work he received the grand prize of the Academy of Medicine.

TROUT (AS. *truht*, from OF. *truite*, from Lat. *tructa*, *tructus*, from Gk. *τρώκτης*, *trōktēs*, sort of sea fish, from *τρώγειν*, *trōgein*, to gnaw). Any of many fishes of the family Salmonidæ. (See Salmon.) Some are partly anadromous, but most of the species live exclusively in fresh waters, and occur in most of the lakes and streams of northern regions. They are all voracious and more or less gamy. Their food consists of almost any sort of fresh animal matter —smaller fishes, crustaceans, insect larvæ, and the like. The trout, like the salmon, spawn during the colder months of the year, varying with the latitude and the species.

Trout may be classed into two main groups. The one group, belonging to the genus *Salmo*, has a flat vomer, supplied with teeth, the body with larger scales than the other group, which has a boat-shaped vomer, the shaft destitute of teeth. The latter group is more perfectly restricted to fresh waters than the former. The former group includes the salmon trout, and the latter the chars, such as the book trout. The salmon trout of European waters (*Salmo trutta*) resides in salt water, and enters the rivers to spawn. Its fresh-water variety, the brown trout (*Salmo fario*), occurs in the lakes of Europe, and has been extensively domesticated in English and North American waters. In consequence of its greater adaptability, it is now replacing the native brook trout in many localities, much to the disgust of the sportsman. Another Scottish variety, the Lochleven trout, differs from the brown trout in the greater growth of the pectoral and caudal fins, in the greater number of cæcal appendages, and in other minor characters.

The American salmon trout (*Salmo gairdneri*) is a large trout, abundant in the Columbia and other rivers flowing to the Pacific coast. (See Steelhead.) A variety of it, the Kamloops trout, or "stit-tse," occupies the lakes of British Columbia and northern Washington.

The rainbow or Coast Range trout (*Salmo irideus*) is smaller than the preceding, has larger scales and brighter colors. It is native in the mountain streams of the Pacific coast, and probably enters the sea. It is very variable, presents many geographical varieties, such as the brook trout of western Nevada, the trout of Mt. Shasta, golden trout of Mt. Whitney, the McCloud River trout, and others. It has been transplanted successfully into the mountain streams of the eastern United States, and has been domesticated to some degree. The "cutthroat" or Rocky Mountain trout (*Salmo mykiss*) is a common trout of very wide distribution in all the clear streams of the Rocky Mountains and Sierra Nevada, from Kamchatka and Alaska to northern Mexico. Its scales are smaller than in the nearly related species, hyoid teeth are usually present, and it is very closely related to *Salmo gairdneri*. This species often enters the sea, and is very variable, many geographical races being recognized, one of which, "Clarke's trout" of the Columbia River, is illustrated on the Plate of Salmon.

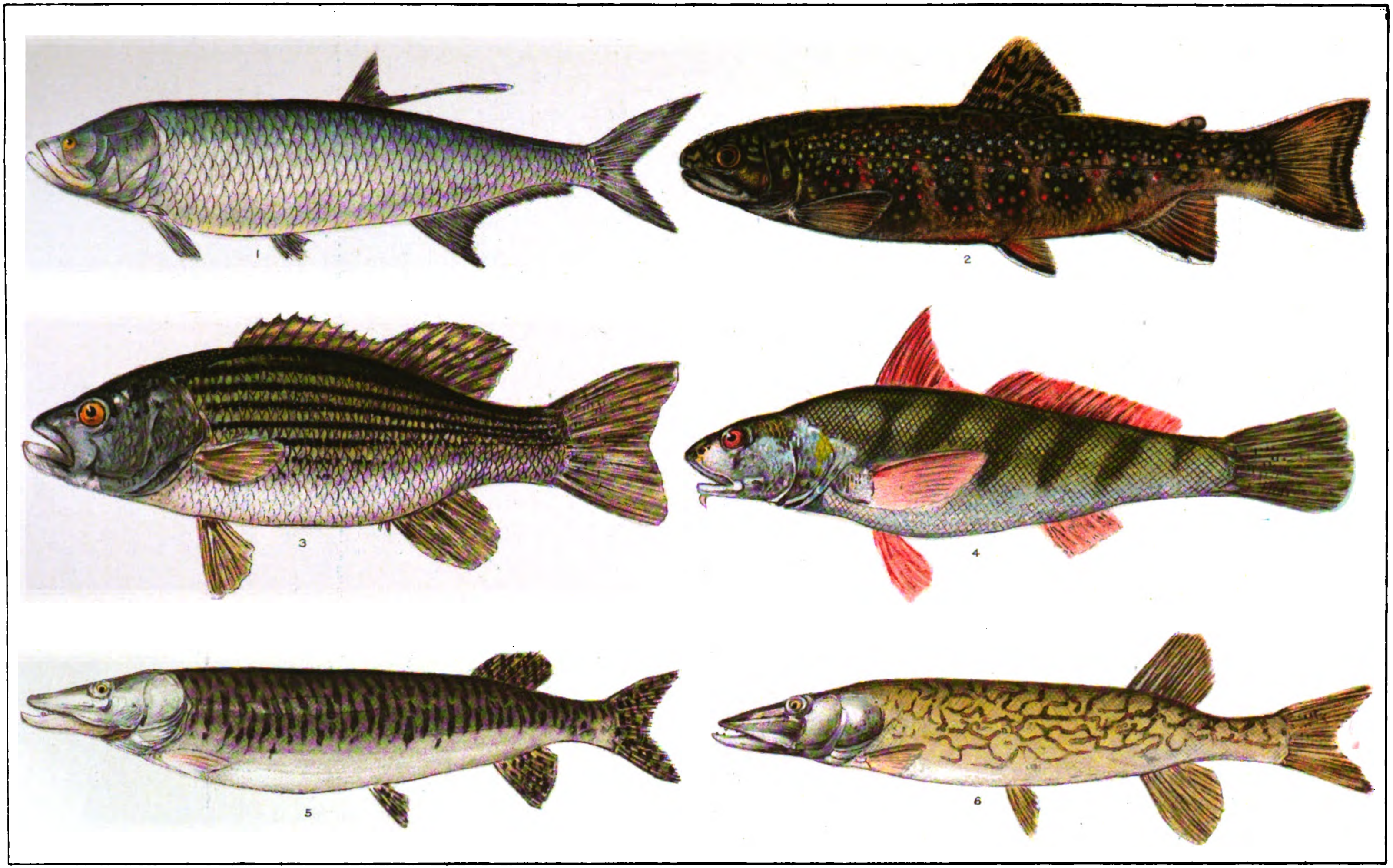
The Great Lakes trout, "longe," "togue," or "namaycush," differs from *Salmo* in the absence of teeth on the shaft of the vomer, and from the brook trout in its larger size and well-developed teeth on the hyoid bone. It inhabits all the larger lakes of eastern North America, and is one of the more important food fishes of the Great Lakes region. The variety "siscowet," found only in the deep water of Lake Superior, has excessively fat flesh, and is not prized as food. See Namaycush.

The principal chars of American waters are the common brook or speckled trout, the Dolly Varden, the oquassa, and the European brook trout. The brook trout (*Salvelinus fontinalis*) is the best known, abundant in all clear, cold streams of eastern North America south to the headwaters of the Savannah. It differs from the other species of the genus in its back being strongly marbled with olive and black. It has been introduced into the Western streams; and many hybrids between this and the rainbow trout and other species exist. Its extreme length may be 18 inches, but it is usually much smaller. It is a favorite for its gamy qualities and for its flavor. See Colored Plate of Game Fishes.

The Dolly Varden trout (q.v.), or malma, is a native of northwestern America, and has red spots on both back and sides. The oquassa trout (*Salvelinus oquassa*), "quasky" or "blueback," is a small trout of the Rangely group of lakes in western Maine, dark blue, with small red spots, usually confined to the sides. Similar and still smaller varieties of this most beautiful of the trout exist in the lakes of Quebec and in those of subarctic America.

The European brook trout (*Salvelinus al-*

AMERICAN GAME-FISHES



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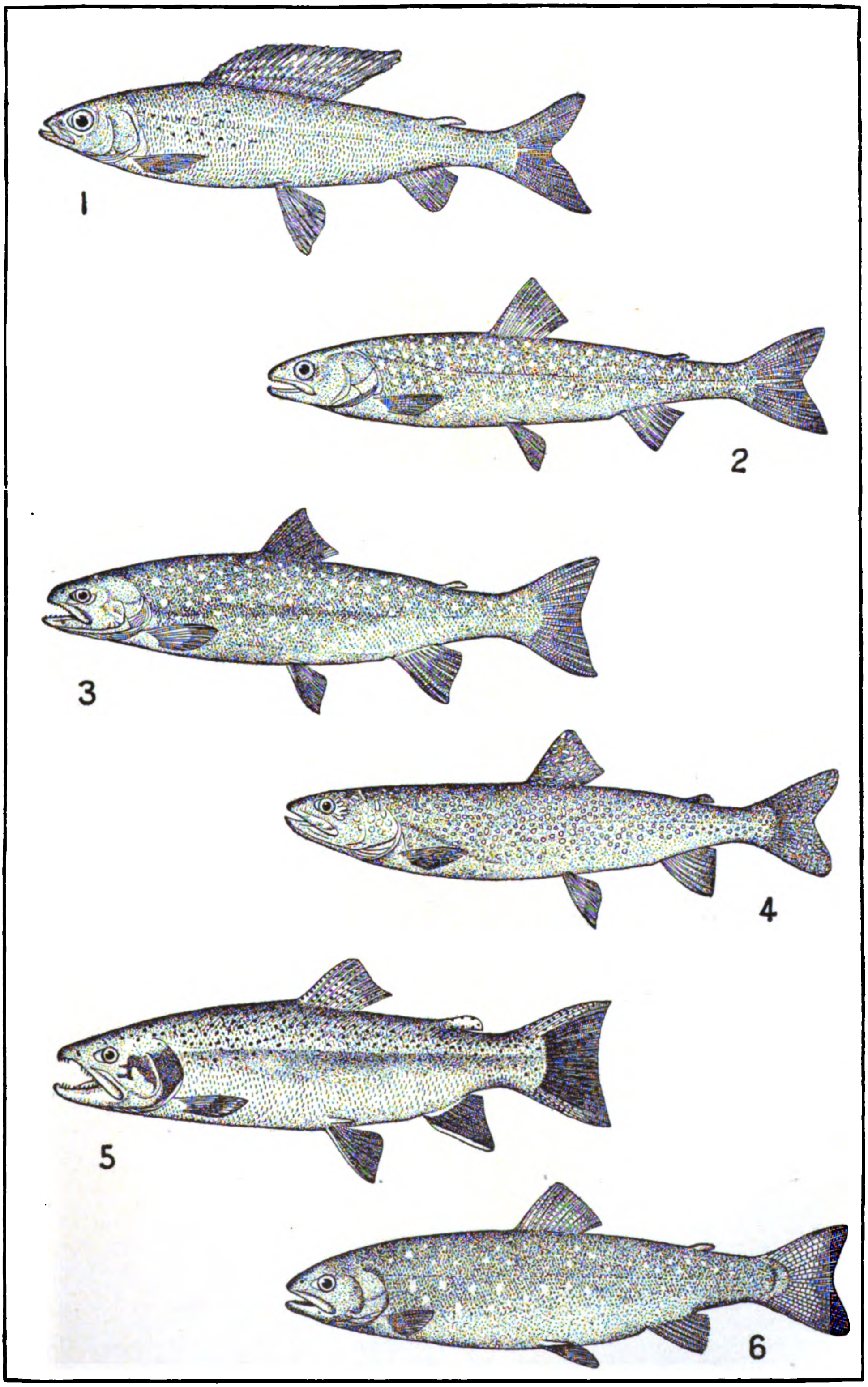
1	TARPON	1/15	NATURAL SIZE	– TARPON ATLANTICUS
2	TROUT	1/4	" "	– SALVELINUS FONTINALIS
3	BASS	1/8	" "	– ROCCUS LINEATUS
4	KINGFISH	1/15	NATURAL SIZE	– MENTICIRRHUS SAXATILIS
5	MUSKALLUNGE	1/12	" "	– ESOX MASQUINONGY
6	PICKEREL	1/4	" "	– ESOX AMERICANUS

TROUT AND GRAYLING



1. MICHIGAN GRAYLING (Thymallus tricolor).
2. OQUASSA TROUT (Salvelinus oquassa).
3. DOLLY VARDEN TROUT (Salvelinus malma).
4. NAMAYCUSH (Cristivomer namaycush).
5. RAINBOW TROUT (Salmo irideus).
6. SUNAPEE TROUT (Salvelinus alpinus, var. aureolus).

pinus) has the red spots only on the sides, and the mouth is rather smaller than in the preceding. It occurs in the cold lakes and mountain streams of northern Europe and Asia, and in northeastern North America. It is variable and is represented by several varieties—such as the Greenland char, the long-finned char, and the sunapee or golden trout. The last named is very local in its distribution, having been taken in Sunapee Lake and a few other lakes in New Hampshire and Maine. It is highly prized because of its brilliant colors and graceful form. Much uncertainty remains as to its origin and relationship. It has strong affinities with the European form and by some is considered to have been introduced from there. Much pains is being taken to increase this species by artificial propagation and transplantation. See Fish Culture.

There are other species of trout of minor importance both in America and Europe and Asia; and many fishes not truly trout are locally so called. Compare Salmon; Grayling. Consult: D. S. Jordan, *Fishes* (New York, 1908); Jordan and Evermann, *American Food and Game Fishes* (new ed., ib., 1914); Ernest Phillips, *Trout in Lakes and Reservoirs: A Practical Guide to Managing, Stocking, and Fishing* (ib., 1914); Louis Rhead, *American Trout Stream Insects* (ib., 1916); also references under Angling; Fish; Salmon.

TROUT FISHING. With the possible exception of the black bass, there is no fish that affords more sport to the angler or that is found over a greater range of country than the brook trout. It may be taken with the fly or with bait, but the former method is considered generally the more sportsmanlike. In bait fishing, the trout is likely to be killed or badly injured, whereas in fly fishing the fish generally is hooked in the lip and can be returned to the water unharmed. In lakes and ponds in summer time, when the surface of the water becomes warm, trout make for deep water, and bait must be used. It is impossible to do more than give the general rules controlling the selection of flies: In size, the fly should be selected to meet the condition of the water rather than the size of the fish; thus, if late in the season and the water of a clear stream is low, sober-colored flies on No. 10 or 12 hooks are usually the best. See Fishing; Fly-Casting.

TROUT PERCH. One of the small fishes of the North American family Percopsidæ, represented abundantly in the Great Lakes by the "sand roller" (*Percopsis guttatus*) and by a second genus and species in Oregon. This family constitutes the suborder Salmopercæ; the form of the body and the head and mouth are perchlike, while the fins are salmon-like. These fishes are of particular interest because of their relationship with generalized archaic forms, of which they seem to be the survivors. Consult Jordan and Evermann, *Fishes of North and Middle America* (Washington, 1896).

TROUVÈRE, trōō′vâr′ (Fr., from *trouver*, to find, compose). The Northern French term answering to the Provençal troubadour (q.v.), applied usually to the original poets who composed the works which the jongleur performed. The distinction, however, is not absolute, as there are instances of trouvères who performed their own works, and occasionally of jongleurs who aspired to composition. The trouvère was usually a man of some rank and standing, either priest or knight. See French Literature; Jongleur.

TROUVILLE, trōō′vēl′. A fishing town and seaside resort of the Department of Calvados, France, at the mouth of the Touques, 136 miles by rail west-northwest of Paris, and 9 miles south of Havre (Map: France, N., F 3). It has risen from the humble fishing village to the rank of the most fashionable watering place in France. Its equable climate, agreeable situation, remarkably fine beach, and many handsome villas make it an ideal resort during the summer and autumn months. There are a Louis XIII Hôtel de Ville and a large well-appointed casino. The harbor is thronged with fishing boats, and there is some trade. Pop., 1901, 6137; 1911, 6901. The port is shared with Deauville, a small but well-known sea-bathing resort, a short distance southwest, with a casino. The August races here are attended by the leading circles of Parisian society.

TROVATORE, IL, ēl trō′vȧ-tō′rȧ (It., The Troubadour). An opera by Verdi (q.v.), first produced in Rome, Jan. 19, 1853; in the United States, May 2, 1855 (New York).

TRO′VER (OF. *trover*, *trouver*, to find, compose). One of the old forms of action in common-law pleading, employed to recover damages for the wrongful conversion of personal property. The action was a development of the action of trespass on the case. It is based upon a fiction that the plaintiff has lost his chattels and that the defendant has casually found them, but refuses to deliver them to the plaintiff. Although this fictitious statement must be made in the declaration, it need not be proved, and could not be traversed or denied; and the plaintiff may recover damages on proof of a conversion of his property. Any interest which will entitle a person to the possession of goods is sufficient to maintain this action. See Common Forms; Conversion; Forms of Action.

TROWARD, trō′ård, Thomas (1844–1916). A British philosopher. He was born at Belgaum in the southern Maharatta country, India, and was educated at Victoria College, Jersey. He prepared for the Indian Civil Service and was appointed to a junior magistracy in the Punjab. Eventually he retired with the rank of divisional judge. Returning to England, he lectured in Edinburgh, London, and other cities on topics relating to Mental Science and New Thought (qq.v.). For this work he was well fitted by experience and scholarship. Thirty years' residence in India, during which period he decided cases according to Hindu, Sikh, and Mohammedan law, and also studied the different religious and philosophical systems, had familiarized him with the best thought of the Orient, practical as well as speculative. On the other hand, the western point of view was his by inheritance. Troward contended that the basic spiritual principles underlying all religions were so developed in the Bible as to make it entirely authoritative as a guide to thought and action. Moreover he found spiritual principles to be paralleled by the laws of nature as revealed by modern science, thus indicating a unity of the visible and invisible. Judge Troward's system has the practical aim of helping the individual to recognize his spiritual freedom by showing that mental attitude controls material conditions. His widely read writings, important in their field, include:

Edinburgh Lectures on Mental Science (1906); *Bible Mystery and Bible Meaning* (1907); *Doré Lectures* (1909); *The Creative Process in the Individual* (1911).

TROW'BRIDGE. A market town in Wiltshire, England, on a rocky eminence in the valley of the Biss, 97 miles by rail west of London. Cassimeres, kerseys, tweeds, and woolen cloths of the best qualities are manufactured. The parish church of St. James, which dates from the fourteenth century, contains the remains of Crabbe, the poet, who officiated as clergyman from 1814 to 1832. There are a fine modern town hall and many handsome villas, the residences of wealthy manufacturers. The town owes its origin to an ancient castle, built on the mound called Courthill, which held out for Matilda against Stephen. It was demolished before the reign of Henry VIII, and all traces of it have disappeared. Pop., 1901, 11,562; 1911, 11,815.

TROWBRIDGE, Edmund (1709–93). An American lawyer, born in Newton, Mass. He graduated at Harvard in 1728, and soon rose to eminence as a lawyer. He became Attorney-General of the State in 1749, was for several years a member of the council, and in 1767 was appointed a justice of the Massachusetts Supreme Court, presiding with great ability and fairness at the trial of Captain Preston and his men after the Boston massacre. In 1772 he retired to private life. Though not in full sympathy with the Patriot party, he was strongly opposed to the policy of the British ministry.

TROWBRIDGE, John (1843–). An American physicist. He was born in 1843 and was educated at the Lawrence Scientific School, Harvard, graduating in 1866 and then serving for three years as tutor. After occupying a chair at the Massachusetts Institute of Technology, he returned to Harvard in 1880, was made professor of experimental physics, director of the Jefferson Physical Laboratory (1884), and Rumford professor of the application of science to the useful arts (1888). He established a laboratory course in physics and was one of the pioneers in introducing laboratory work as an essential part of instruction in elementary science. Trowbridge was a member of various international electrical congresses, was elected to the National Academy of Sciences in 1878, and became president of the American Academy of Arts and Sciences. He carried on many important investigations in physics, particularly in electricity, and later investigated the various phenomena connected with the Röntgen rays. Many of his communications were issued under the title of *Contributions from the Physical Laboratory of Harvard College*. Besides these he wrote: *The New Physics* (1884); *What is Electricity?* (1896; new ed., 1903); *Samuel F. B. Morse* (1901). Papers of importance include "The Longitudinal Magnetic Field and the Cathode Rays," in *Proceedings of the American Academy of Arts and Sciences*, vol. xliii (1908), and "Research in Physics," in *Harvard Graduates' Magazine* (1911).

TROWBRIDGE, John Townsend (1827–1916). An American novelist, juvenile writer, and poet, born at Ogden, N. Y. After a common-school education Trowbridge taught for a year in Illinois and afterward was a journalist in New York and Boston, where he settled in 1848. His *Neighbor Jackwood* (1857) was one of the first realistic novels of New England life. The more noteworthy of his many stories, largely for boys and ranking with the best of their kind, are: *Father Brighthopes* (1853); *The Drummer Boy* (1863); *Cudjo's Cave* (1863); *The Three Scouts* (1864); *Neighbors' Wives* (1867); *Coupon Bonds and Other Stories* (1872); *The Silver Medal* (1908); *A Pair of Madcaps* (1909); *The Jack Hazard Series; The Toby Trafford Series; The Start in Life Series; The Tide Mill Series.* Trowbridge also wrote verse, his "Darius Green and his Flying Machine" being especially well known. A collected edition, *Poetical Works*, appeared in 1903. His autobiography, *My Own Story* (1903), throws some interesting sidelights on American literature during the second half of the nineteenth century.

TROWBRIDGE, S(amuel) Breck Parkman (1862–). An American architect, born in New York City. He graduated from Trinity College, Hartford, in 1883, and from the School of Architecture at Columbia in 1886, and then had charge of the erection of the building of the American School of Classical Studies at Athens, Greece. After studying at the Beaux-Arts in Paris, he returned to New York, where he was employed in the office of George B. Post (q.v.) for four years. Later he became a member of the firm of Trowbridge and Livingston, which built many residences, business structures, and public buildings. In 1910 Trowbridge was appointed Chevalier of the Legion of Honor, and in 1915 he was elected to the National Institute of Arts and Letters.

TROWBRIDGE, William Petit (1828–92). An American engineer, born in Oakland Co., Mich. He graduated, first in his class, at West Point in 1848; was assigned to the Corps of Engineers as a brevet second lieutenant; was engaged in astronomical observations at the Military Academy Observatory in 1848–50 and performed important work from 1850 to 1856, when he resigned from the army, on the United States Coast Survey. In 1856–57 he was professor of mathematics at the University of Michigan and in 1857–61 was scientific secretary of the Superintendent of the United States Coast Survey. During the Civil War he was in charge of the Engineer Agency at New York City. He was professor of dynamic engineering in the Sheffield Scientific School of Yale College (1870–77), was adjutant general of the State of Connecticut (1872–76), and from 1877 until his death was professor of engineering in the Columbia School of Mines. He is credited by some with having first suggested the idea of the cantilever bridge. Besides numerous magazine articles, he published *Heat as a Source of Power* (1874).

TROY (Lat. *Troia*, from Gk. *Τροία*). The most famous city of Greek legend. It was in the northwest corner of Asia Minor, on a small plain through which flows to the Hellespont the ancient Scamander (now Mendere), entered near its mouth by a small stream from the east, the ancient Simoïs (now Dumbrek Su). In the angle once formed by these streams (the modern courses have greatly altered) lies a low hill, jutting from the range of Mount Ida, which was known in Roman times as *Ilium Novum*, and was regarded by many as the successor of the Homeric Troy. Near by is the modern village of Hissarlik. The claims of this site had always found defenders, but since the work of Le Chevalier at the end of the eighteenth century there had been a strong trend of scholarly opinion in favor of the ruins near Bunarbashi on the Bali Dagh, a steep cliff above the Scamander, south of its entrance to the plain. The presence of warm springs near by served to strengthen this identification. The site, as well as the summit on the opposite side of the valley, was certainly fortified in early times as a protection against incursions from the south, but excavation has shown conclusively that the capital of the district lay on the hill of Hissarlik, less than 4 miles from both the Ægean and the Hellespont, and corresponding far more closely than could have been reasonably expected with topographical indications in the *Iliad*. The credit for the exploration of this site belongs to Heinrich Schliemann (q.v.), who began excavations in 1870, and in the three following years had laid bare enough to show that underneath the Roman and later Greek ruins which crowned the hill were remains of a settlement of unknown antiquity, even though the names "Scæan Gate" and "Priam's Palace" seemed extravagant. In 1878–79 another campaign with scientific coadjutors led to more definite results, which were still further increased by excavations in 1882 by Schliemann and Dörpfeld. Another visit (1890) led to further important modifications of previous results, and, though the death of Schliemann in December, 1890, prevented immediate continuation of the work, it was resumed in 1893 by Dörpfeld.

The history of the hill as read in the excavations and later writers is that of a series of at least nine successive settlements, many only small collections of wretched huts, though a convenient terminology has dignified them all as "cities." The first (1) settlement is a small group of dwellings surrounded by a wall, belonging to the end of the Neolithic period. The second (2) city, held by Schliemann to be the Homeric Troy, was defended by a strong wall of rough stone, topped by crude brick, and seems to have extended its circuit twice, the second time with marked alterations in the situation of the gates. Within were several houses, consisting of a great hall and vestibule, of the type found later in Mycenæ and Tiryns, and apparently described in the Homeric poems. The civilization indicated by the pottery and lesser finds shows that the inhabitants were at the beginning of the Bronze age, belonging to the period of the so-called "Island" civilization. (See ARCHÆOLOGY.) The rulers were evidently of some wealth and power, but their identity seems lost forever. The continuity of tradition in the pottery and general type of building, and the similarity with much found in Phrygia, seem to warrant the belief that there was no change of race from the second to the sixth city, and that this people were kindred of the Indo-European Phrygians. Yet they were not at peace with their neighbors, as is shown by the fact that the second city was burned, and the site left desolate. The place was resettled, however, and the houses of the third (3) city were built on the rubbish which concealed their predecessors; the wall also was repaired, and the gates narrowed for greater security. This city, too, was destroyed, or perhaps abandoned, but was again resettled (4), as an open village. To this succeeded (5) another village of little huts, defended by a wall of no great strength. The next city (6) was, however, different. It was defended by a strong wall of smoothed stone, of far greater circuit than that of city No. 2, and of such workmanship that a bit discovered by Schliemann was attributed to the Hellenistic period. This wall was pierced by gates, provided with strong flanking towers. Within were houses of considerable size, but of the same simple plan as those in the second city. Owing to a great terrace built by the Romans, which cut down the top of the hill, the remains of this city are preserved only around the edge, while the centre, which doubtless contained the royal palace, has vanished. As Schliemann's excavations were almost entirely confined to the centre of the hill, it was possible for him to miss this city, which belonged to the Mycenæan period, and certainly corresponds to the Homeric Troy. It seems clear, from the objects found, that the kings of Troy ruled over a people not advanced in artistic work, the old plain pottery continuing in general use. After no very long period another settlement (7) covered the hill. Mycenæan vases have been found in its lower strata, but whether the inhabitants were survivors of the Trojans, or the first wave of Greek settlers, cannot certainly be determined. It is clear that the Cimmerian invasion in the eighth century B.C. reached this hill, and after destroying the inhabitants, either Treres or Cimmerians took up their abode on the site, till in the seventh century they were driven forth and Troja or Ilion was occupied by Greeks (8). The settlers seem to have been a small band of Æolian colonists, who were cut off from the sea by other Greek towns, and seem to have lived with little to recall the ancient glory of the place. The prosperity of the place (9) began with the visit of Alexander in 334 B.C., and the temple of Athena Ilias became after his death the centre of a league of free cities of the Troad. Near the end of the fourth century Lysimachus fortified it with a wall some 5 miles in circumference, and also built on the hill a marble temple of Athena. Later the town was under the control of Seleucus, but its history during this time is obscure. It passed under the Roman protection (189 B.C.) and was honored as the city of Æneas, and thus the parent of Rome. In the first civil war, about 85 B.C., it was stormed and sacked by the Marian general Fimbria. New prosperity came with Julius Cæsar, for the Julian family traced their descent from Ascanius, and Augustus rebuilt the temple of Athena and surrounded it with courts and porticoes. Later emperors favored it, and Constantine planned to make it the seat of his new capital. It was for a long time the seat of a bishopric, but was plundered about 1306 by the Turks and since then has lain in ruins.

For the legendary history of Troy, see TROJAN WAR.

Bibliography. The excavations of Schliemann and Dörpfeld are recorded by them in *Trojan Antiquities* (London, 1874), *Ilios, the City and Country of the Trojans* (ib., 1881), *Troja: The Results of the Latest Researches and Discoveries on the Site of Homer's Troy* (ib., 1884), *Bericht über die Ausgrabungen in Troja im Jahre 1890* (Leipzig, 1891); also C. Schuchardt, *Schliemann's Excavations* (trans. by Eugénie Sellers (London, 1891); W. Dörpfeld, *Troja, 1893* (ib., 1894); W. Dörpfeld and

others, *Troja und Ilion* (2 vols., 1902); Walter Leaf, *Troy: A Study in Homeric Geography* (New York, 1912); id., *Homer and History* (London, 1915); K. Baedeker, *Konstantinopel, Balkanstaaten, Kleinasien, Archipel, Cypern* (2d ed., Leipzig, 1914). See also HOMER.

TROY. A city and the county seat of Pike Co., Ala., 52 miles by rail south by east of Montgomery, on the Atlantic Coast Line and the Central of Georgia railroads (Map: Alabama, D 4). It is the seat of a State normal school, and has a Carnegie library. Troy is the shipping centre for large cotton interests, and has some manufactures, of which fertilizers are the most important. Troy was settled in 1843 and incorporated the same year. Pop., 1900, 4097; 1910, 4961.

TROY. An important manufacturing city and the county seat of Rensselaer Co., N. Y., situated at the head of navigation of the Hudson River, 6 miles north of Albany and 149 miles north of New York (Map: New York, G 5). It is the western terminus of the Boston and Maine Railroad and is also on the New York Central and Hudson River, Delaware and Hudson, and Rutland railroads, and five interurban trolley systems. Additional transportation facilities are afforded by the Hudson River and the new State Barge Canal (q.v.). On the west side of the river lie the cities of Cohoes and Watervliet and the villages of Green Island and Waterford, all connected with Troy by bridges and commercially a part of it, making a contiguous urban population exceeding 130,000.

Troy is situated on the level ground along the river front and extends over the hills directly eastward. The water front is seven miles in length and is occupied by large factories and mercantile establishments. There are 100 acres in the parks, the largest being Prospect Park, a well-developed pleasure ground overlooking the lower sections of the city and affording a view of the vicinity for miles around. The Soldiers' and Sailors' Monument is in Washington Square. Oakwood Cemetery is of interest for its natural beauty; it contains many notable monuments and the Earl Memorial Chapel. Among edifices of note are the courthouse, post office, the savings-bank building with the music hall, and the Hart Memorial Library, a fine example of Italian Renaissance architecture. Prominent among the city's features is the Samaritan Hospital, constructed in 1914 at a cost of more than $600,000. There are two other hospitals, four orphan asylums, four homes for the aged, a Young Men's Christian Association, a Young Women's Christian Association, and Boys' and Girls' clubs.

Industrially Troy ranks fifth among the cities of the State, while in the volume of its commerce it stands fourth. Nearly $60,000,000 is invested in its manufacturing enterprises and their products have a yearly value of over $40,000,000. The annual payroll of its 21,000 employees exceeds $18,000,000. It enjoys exceptional water-power facilities from the State dam across the Hudson at the north end of the city and from two tributary streams which drop more than 200 feet within the city limits. Troy is the world centre for the manufacture of shirts, collars, and cuffs, producing 89 per cent of the collars and cuffs made in the United States. It is the leading city of the country also in the production of laundry machinery, valves, horseshoes, engineering instruments, and bells. Its brush, stove, ventilator, firebrick, paper-box, hosiery, knit-goods, and malleable-iron factories are also important.

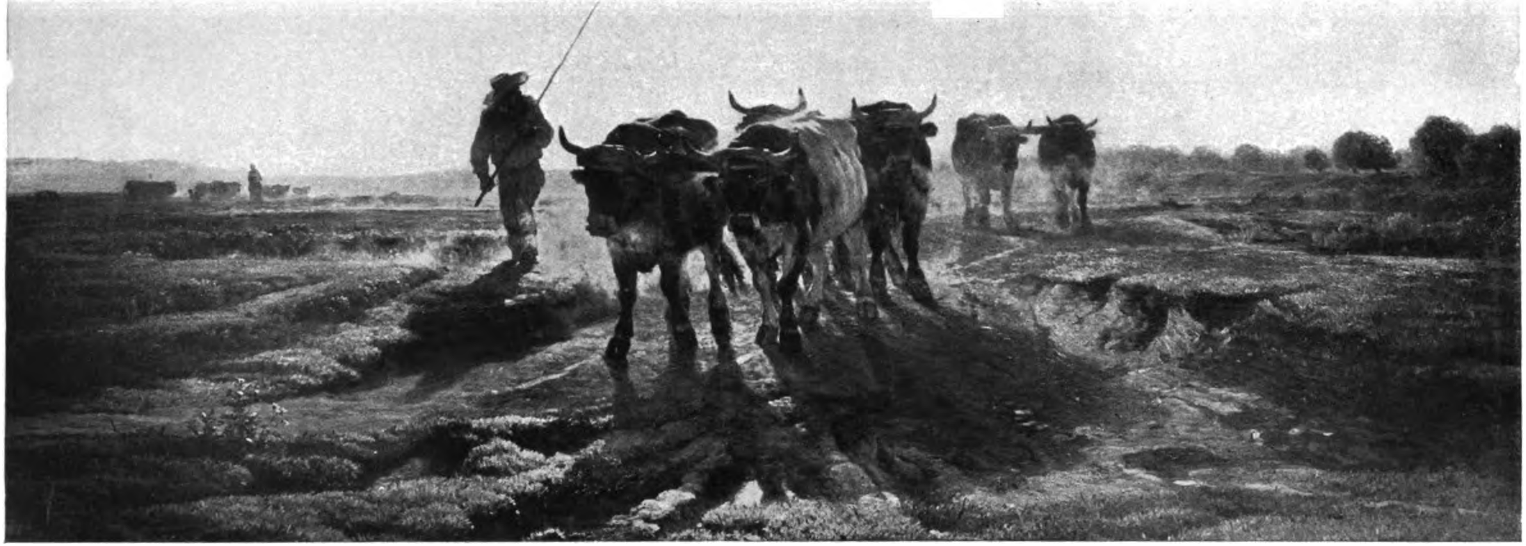
Among the educational institutions are the Rensselaer Polytechnic Institute (q.v.), and the Emma Willard Seminary, the pioneer school in America for the higher education of women (founded in 1815). There are also two musical conservatories with a combined enrollment of 900 pupils.

The government is vested in a mayor and common council, elected every two years, and in various administrative departments. More than $1,250,000 is spent annually by the city for maintenance and operation. The water works, which represent an outlay of $4,620,710, are the property of the municipality. The net debt of the city in 1916 was $4,743,047.92; the assessed valuation of real and personal property, $60,313,860. The population, in 1800, was 4296; in 1850, 28,785; in 1900, 60,651; in 1910, 76,813; and, according to the State census of 1915, 75,480.

The site now occupied by Troy was visited by members of the crew of Henry Hudson's *Half Moon* in 1609, but it was not until 1659 that Jan Barentsen Wemp, the first settler, arrived. He purchased land from the Indians by the consent of the patroon, this being part of the Van Rensselaer grant of 1629. Derick van der Heyden bought a large farm here in 1707 and his descendants laid out a town along the river eighty years later to accommodate a stream of emigrants from Connecticut. The settlement, known first as Van der Heyden's or Ashley's Ferry, was named Troy in 1789. Two years later a town government was formed and in 1794 Troy was incorporated as a village. It became a city in 1816. The annexation of Lansingburg in 1901 gave it an area of 9.62 square miles. In 1916 its centennial was celebrated with appropriate ceremonies. Consult: A. J. Weise, *History of the City of Troy* (Troy, 1876); id., *City of Troy and its Vicinity* (ib., 1886); id., *Troy's One Hundred Years* (ib., 1891); G. B. Anderson, *Landmarks of Rensselaer County* (Syracuse, 1897); *New Troy*, a pamphlet issued by the Troy Chamber of Commerce (Troy, 1913).

TROY. A city and the county seat of Miami County, Ohio, 83 miles by rail north by east of Cincinnati, on the Cincinnati, Hamilton, and Dayton, and the Cleveland, Cincinnati, Chicago, and St. Louis railroads (Map: Ohio, B 5). Farming is the leading industry of the surrounding country. There are manufactures of carriages, wagons, electric coffee mills, hardware, wind shields, automobile bodies, tile, bricks, bentwood, dashboards, and iron and lumber products. Pop., 1900, 5881; 1910, 6122.

TROY, trwä, JEAN FRANÇOIS DE (1679–1752). A French decorative and genre painter. He was born in Paris and was the son and pupil of the portrait painter François de Troy (1654–1730). He also studied for several years in Italy and on his return to Paris was received at the Academy (1708). Many important commissions for mural decoration were executed by him, among the finest being the "Plague at Marseilles" (excellently engraved by Thomassin), and the "First Chapter of the Order of the Holy Ghost" (Louvre). They are well composed and display a vigorous style. He also



TROYON
"OXEN GOING TO WORK," FROM THE PAINTING IN THE LOUVRE

painted many small canvases in the style of Lancret, such as "The Oyster Breakfast" (Chantilly), "The Hunt Breakfast" (Wallace collection, London), and "The Surprise" (South Kensington Museum). In 1738 he was appointed director of the French Academy at Rome, and about this time designed his celebrated series from the histories of "Esther," "Medea," and "Jason" for the Gobelins tapestries.

TROYENS, Les, lā trwä'yäN'. An opera in two parts by Berlioz (q.v.). 1. *La prise de Troie* (The Capture of Troy), first produced in Karlsruhe, Dec. 7, 1890; 2. *Les Troyens à Carthage* (The Trojans at Carthage), first produced in Paris, Nov. 4, 1863. The first complete production of the entire work (both parts) was the one at Karlsruhe, Dec. 7, 8, 1890. In the United States only fragments have been produced in concert form (1877, 1887, New York).

TROYES, trwä. The capital of the Department of Aube, France, on the left bank of the Seine, 104 miles by rail east-southeast of Paris (Map: France, N., J 4). It presents a quaint, mediæval appearance. The fine Cathedral of Saint-Pierre (thirteenth to sixteenth century, with a splendid rose window) is in the Flamboyant style. The small Church of Saint-Urbain, founded by Pope Urban IV, is a charming example of the thirteenth-century Gothic. La Madeleine has a superb rood screen. Saint-Jean (fourteenth to sixteenth century) is noteworthy for its stained glass and its two paintings by Mignard. Saint-Nicolas and Saint-Pantaléon are both in the Gothic style of the sixteenth century. In the old Abbey of Saint-Lupus are the public library (136,000 volumes and 15,095 manuscripts) and an interesting museum. The monument to the children of Aube, in commemoration of the Franco-German War, was erected in 1900. The chief industry is the manufacture of silk, cotton, and woolen stockings. There is a school of history. The Seine is canalized here and divides into several arms in the city. Pop., 1911, 55,486.

The capital of the Celtic *Tricasses*, Troyes was the Roman *Augustobona* (later *Trecæ*). The town was the capital of the counts of Champagne, and early rose to importance as a centre of trade. The treaty of 1420, which provided for the succession of Henry V of England to the French throne, was signed here. Jeanne d'Arc took the town in 1429, and a century later it was partly destroyed by Charles V. The revocation of the Edict of Nantes reduced the population, which was largely Protestant, to less than one-fourth of its former numbers. Consult J. T. Boutiot, *Histoire de la ville de Troyes et de la champagne méridionale* (4 vols., Paris, 1870–74), and A. Prévost, *Histoire du diocèse de Troyes pendant la révolution* (3 vols., ib., 1908–09).

TRO'YLUS AND CRY'SEYDE. A poem by Chaucer, written about 1380, probably largely a translation of Boccaccio's *Filostrato*, though Chaucer may have drawn directly from Benoît de Sainte-More's *Roman de Troyes* of the twelfth century, in which the episode is first introduced, or from Guido della Colonna's prose novel based on it.

TROYON, trwä'yôN', Constant (1810–65). A French animal and landscape painter. He was born at Sèvres, Aug. 25, 1810, and early worked there as a decorator in the porcelain factory, receiving meanwhile lessons in design from Rioceux and later from Poupart. His first Salon pictures, exhibited in 1833, were mediocre in character, but a fortunate acquaintance with the Romanticist Roqueplan modified his style. Later he became associated with Rousseau, Diaz, and Dupré of the Barbizon group and he soon became known as a successful landscape painter. Of greatest importance for his career was his visit, in 1847, to Holland. Here his observation of the rich animal life of the fields, together with his study of Dutch art, especially the animal painters Potter and Cuyp, turned his attention to animal painting, to which thenceforth he devoted himself. Success and fortune came to him early; he received first-class medals in 1846, 1852, and 1855, and the decoration of the Legion of Honor in 1849. When orders multiplied, his rapidity of execution occasionally resulted in inferior workmanship. In consequence of overwork he lost his reason in 1863, and he died in Paris, Feb. 21, 1865.

Troyon is the principal animal painter of France, if not of modern times. No man has succeeded better in portraying the character of animals—the stolid indifference of the ox, the helplessness of the sheep. His animals, however, were never detached studies, but an integral part of the landscape. More than any other cattle painter he is a consummate master of landscape, which he portrays with an epic simplicity equaled only by Rousseau. At first rather heavy, his execution speedily became broad and impressive; his color is rich and glowing. The poetic treatment of his subject, especially in the handling of light and shadow, classifies him with the Barbizon group. His pictures often bear no distinctive names beyond the general designation of "Landscape with Cattle." In the Louvre are 31 examples, including 18 of the Chauchard collection. Among the most celebrated of these are: "Return from the Farm"; "Oxen Going to Work"; "The Goose Girl"; "White Cow Scratching Herself." He is also well represented in French provincial museums, and in the public collections of the United States. In the Metropolitan Museum, including the Vanderbilt collection, are six examples, of which the finest are "Holland Cattle"; "On the Road," a marvel of bright color; and "Autumn Woods with Cattle."

The Art Institute of Chicago possesses seven examples, including "The Return from Market," "Cattle Scene," and "Landscape with Cattle"; and he is also represented in the Wilstach collection, Philadelphia, the Brooklyn Institute Museum, the Corcoran Gallery, Washington, and the San Francisco Art Museum. Consult: Henri Dumesnil, *Troyon: Souvenirs intimes* (Paris, 1888); A. Hustin, *Constant Troyon* (ib., 1893); J. C. Van Dyke, *Modern French Masters* (New York, 1896); Walther Gensel, *Corot und Troyon* (Bielefeld, 1906); and for a list of his works, Louis Soullié, *Les grands peintres aux ventes publiques* (Paris, 1900).

TROY WEIGHT. See Weights and Measures.

TRÜBNER, trụb'nẽr, Nicholas (Nikolaus) (1817–1884). A London publisher, born in Heidelberg, Germany. After learning the bookseller's trade he went to London in 1843 and was employed by the Longmans. In 1851 he entered into partnership with Thomas Delf and afterward with David Nutt, and soon became the head of the flourishing publishing house of Trübner & Co. One of his successful enterprises was a development of the American trade. In 1855 he published the admirable *Bibliographical Guide to American Literature,* which was greatly enlarged in 1859. He found time to study Sanskrit, Hebrew, and Basque, and wrote several learned books. He performed great services to scholarship by issuing works shunned by ordinary publishers. Two remarkable series of such works were *Trübner's Oriental Series* and the *British and Foreign Philosophical Library*. He was also the publisher of the Early English Text and other societies.

TRUCE (plur. of obsolete Eng. *true*, truce, true, AS. *trēowe, trywe,* Goth. *triggws*, Ger. *treu*, true; connected with OPruss. *druwis*, faith). In warfare, a truce closely resembles an armistice (q.v.), the two terms being frequently used as synonyms. Practically the truce is a prelude to or the interval necessary to arrange for an armistice. In either case it is but a temporary cessation of hostilities, and may be merely local, arranged to afford safe conduct for the bearer of a message, or to permit the combatants to bury their dead; or, if general, to admit of peace pourparlers. International agreement as well as the unwritten law of the battlefield forbids either side taking advantage of a period of truce to improve their strategic advantage by changes of position, disposition of troops, bringing up of reserves, or other reinforcements. A general truce is only made by the rulers or governments concerned, while a local truce may be arranged by the local commanders. During a truce a definite arrangement is made detailing the liberties permitted each combatant. It is understood, however, that each side is at liberty to carry out such operations as would have been possible during actual hostilities. Violation of a truce by either party, or any form of treachery regarding it, instantly terminates the truce. See Armistice; Flag of Truce; War.

TRUCE, Flag of. See Parley.

TRUCE OF GOD (ML. *treuga Dei*). In the Middle Ages private warfare was very common, and the Church synods, in order to limit what they could not wholly repress (see Peace of God), in the eleventh century and later, frequently passed decrees that there should be no such warfare during certain holy seasons and on certain days. The seasons during which peace was observed extended from Advent to Epiphany, and from Septuagesima to one week after Pentecost. In addition the time from Wednesday night to Monday morning of each week and all saints' days were included. By the end of the eleventh century only about eighty days in the year were left free for private warfare, but most of these days came in summer when the fighting would naturally be most common. These decrees of the councils, although frequently repeated, had little effect. Sometimes the King, too, lent the truce the weight of his authority and thus made it a peace of the land. Consult: August Kluckhohn, *Geschichte des Gottesfriedens* (Leipzig, 1857); Ludwig Huberti, *Studien zur Rechtsgeschichte der Gottesfrieden und Landfrieden* (Ansbach, 1892); Ernest Lavisse, *Histoire de France*, vol. ii, part ii (Paris, 1901).

TRUCKEE (trŭk′ē) **RIVER.** See Great American Desert.

TRUCK FARMING. See Agriculture; United States.

TRUDELIN, trụ′de-läɴ′. See Fridolin.

TRUDEAU, trōō′dȯ, Edward Livingston (1848–1915). An American physician, noted as an authority on tuberculosis, to the study of which he devoted his life. He was born in New York City and graduated from the College of Physicians and Surgeons there in 1871. After a brief period of practice in New York he was obliged by pulmonary disease, contracted through nursing his brother, to go to the Adirondack Mountains. There he remained from 1873 to the end of his life. In 1884 the guides and residents of Saranac Lake gave money and land enough to enable Trudeau to found his famous sanitarium for the treatment and cure of incipient tuberculosis in working men and women. This was the first American institution to attempt the climatic and open-air method of treatment of the disease. In 1894 Trudeau founded the Saranac Laboratory for the study of tuberculosis, the first of its kind in America. One of his most noted patients was Robert Louis Stevenson. Trudeau contributed a vast number of articles to medical publications. His success in fighting the great white plague received recognition at home and abroad; in 1905 he was president of the Association of American Physicians, in 1910 president of the Congress of American Physicians and Surgeons, and he was also the first president of the National Association for the Study and Prevention of Tuberculosis. Consult his *Autobiography* (Philadelphia and New York, 1916); Stephen Chalmers, *The Beloved Physician* (Boston, 1916).

TRUE, Alfred Charles (1853–). An American educator and agriculturist, a son of Charles K. True (q.v.). Born at Middletown, Conn., he graduated at Wesleyan University in 1873. After teaching in the State normal school at Westfield, Mass., for several years, he studied at Harvard in 1882–84. In 1884–88 he was an instructor at Wesleyan. Afterward in the United States Department of Agriculture, he was successively editor, vice director, and from 1893 to 1915 director of the Office of Experiment Stations, and in 1915 he became director of the States Relations Service. He instituted agricultural investigations in Alaska, Hawaii, Porto Rico, and Guam, and for many years supervised investigations on human nutrition, irrigation, and drainage. He gave special personal attention to studies of agricultural education and was largely instrumental in its improvement and extension. In 1902 he was dean of the first graduate school of agriculture in the United States, held at Ohio State University, and thereafter of several such schools in other States, and in 1914 was president of the Association of American Agricultural Colleges and Experiment Stations. Later he had general supervision of the coöperative extension work in agriculture and home economics under the Smith-Lever Extension Act. For many years he was editor in chief of the *Experiment Station Record* and of *Experiment Station Work;* he also prepared numerous bulletins, and contributed to the New International Encyclopædia and the New International Year Book.

TRUE, Charles Kittredge (1809–78). An American Methodist Episcopal clergyman, educator, and author. He was born in Portland, Me., graduated at Harvard in 1832 and the next year entered the New England conference. Subsequently he was agent of the New England Education Society, principal of Amenia Seminary, professor of intellectual and moral science in Wesleyan University (1849–60), and financial agent of Wesleyan (1870–73). He published: *The Elements of Logic* (1840); *Shawmut; or, the Settlement of Boston by the Puritan Pilgrims* (1845); *John Winthrop and the Great Colony* (1875); *The Life and Times of Sir Walter Raleigh* (1877); *The Life and Times of John Knox* (1878); *Memoirs of John Howard* (1878); *The Thirty Years' War* (1878); *Heroes of Holland* (1882); *Life of Captain John Smith* (1882).

TRUE, Frederick William (1858–). An American zoölogist, born at Middletown, Conn., and educated at New York University (B.S., 1878; M.S., 1881). Becoming connected with the department of biology of the National Museum in 1881, he was head curator from 1897 to 1911, and thereafter served as Assistant Secretary of the Smithsonian Institution. He was the United States delegate to the Seventh International Zoölogical Congress in 1907. In his scientific work he made a specialty of the study of whales, his writings including: *Review of the Family Delphinidæ* (1889); *The Whalebone Whales of the Western North Atlantic* (1904); *An Account of the Beaked Whales of the Family Ziphiidæ* (1910); *Observations on Living White Whales* (1911).

TRUE, Rodney Howard (1866–). An American botanist and physiologist, born at Greenfield, Sauk Co., Wis. He graduated from the State university in 1890 and studied also at Leipzig (Ph.D., 1895). He taught school for two years, served as principal of the Wisconsin Academy at Madison in 1892–93, and was instructor and assistant professor of pharmacognosy at the University of Wisconsin in 1895–99. He lectured on botany at Harvard from 1899 to 1901, when he became physiologist of the United States Department of Agriculture. His publications comprise government bulletins and contributions to the *Annals of Botany, Botanisches Centralblatt,* and other scientific journals.

TRUEBA Y COSÍO, trōō-ā′bȧ ê kō-sē′ō, Telesforo de (1798–1835). A Spanish and English author, born at Santander and educated in a Catholic college in England. His studies for a diplomatic career he made in London and in Paris, where he afterward served as attaché to the Spanish Legation until 1822. After his return to Spain he founded an academy uniting the entire younger generation of poets and presided over by Alberto Lista. The two comedies, *El veleta* and *Casarse con 60,000 duros*, which he wrote about this time, entitle him to be ranked with the best Spanish dramatists. In politics an ardent champion of the constitutional party, he took refuge in London on the restoration of the absolute régime and presently earned wide reputation as an English writer. Besides the novels *Gómez Arias* (1828) and *The Castilian* (1829), in imitation of Walter Scott, he published a *Life of Hernan Cortés* (1830); *History of the Conquest of Peru* (1830); *The Romance of History* (1830); *The Exquisites, Salvador de Guerilla, The Incognito* (1831); produced the comedies *Call Again Tomorrow* (1832), *Mr. and Mrs. Pringle, The Man of Pleasure* (1832), and the historical drama *The Royal Fugitive* (1834); but won his greatest success with the descriptive picture of manners, *Paris and London* (1831). Returning to Spain in 1834, he was elected to the Cortes and Secretary of the Second Chamber. He died in Paris. Consult Marcelino Menéndez y Pelayo, *Estudios críticos sobre escritores montañeses* (Santander, 1876).

TRUEBA Y LA QUINTANA, ê lȧ kên-tä′nȧ, Antonio de (?1819–89). A Spanish poet and novelist, born in the Basque region, of peasant stock. He went to Madrid, where he entered business, but devoted his leisure hours to study, and even succeeded in obtaining a university degree. He was made by Isabella II historiographer of Biscay, but was deprived of his post of historiographer when the Queen was banished in 1868. His verse, contained in the two collections *El libro de los cantares* (1852) and *El libro de las montañas* (1868), is marked throughout by a tender melancholy natural to his native Basque region, of which he sings. His historical novels, such as *El Cid Campeador* and *Las hijas del Cid*, are dreary performances. In the short tale of manners, descriptive of his beloved Basque district, he succeeded. There are various collections of these tales, e.g., the *Cuentos de color de rosa*, the *Cuentos campesinos*, the *Cuentos de varios colores*, the *Narraciones populares*, the *Cuentos de madres é hijos*.

TRUE BILL. See Indictment.

TRUE INSPIRATION CONGREGATION. See Communism; Amana.

TRUFFLE, trŭf′'l *or* tru̧f′f'l (OF. *trufle, trufe, truffe,* Fr. *truffe*, truffle, perhaps from Lat. *tubera*, neut. pl., but taken as fem. sing. of *tuber*, swelling, tumor, tuber), *Tuber*. A genus of ascomycetous fungi, globose, or nearly so, of a fleshy substance, with a distinct skin, the whole substance pervaded by a network of serpentine threads (*hymenium*) which bear the spore cases in minute cavities. The species, which are not numerous, are found in central and southern Europe; they are subterranean, found frequently in groups of 10 to 20 a foot or more below the surface soil. They generally grow under deciduous trees, some species being found only under oaks. Some of them are among the most highly valued of esculent fungi. The common truffle (*Tuber cibarium*) is black and has a roughened surface. Its size varies from that of a large plum to a large potato. From its agreeable flavor, it is used in the preparation of many dishes. It is common in the central and southern parts of Europe, chiefly in loose soils, in woods and pastures, as in the pine, oak, and chestnut woods of France and Italy. Other species, as *Tuber æstivum*, *Tuber brumale*, and *Tuber melanosporum*, are found in some parts of France, Italy, and other countries of Europe, and are sought and used in the same manner as the common truffle. Dogs and pigs are trained to seek them, and readily discover their underground location by the scent. Stirring of the soil in gathering them seems to increase productiveness. The white truffle (*Terfezia leonis*), a species of a nearly allied genus, also found in many places, grows half aboveground, is pinkish, and generally as large as a walnut. It is less aromatic, but is used like the common truffle. Attempts have been made to introduce the culture of truffles in parts of the United States where the edible species are little known. See Ascomycetes.

TRUFFLE.

TRUJILLO, trōō-hēl'yō (formerly TRUXILLO, from Lat. *Turris Julii*). A town of the Province of Cáceres, Spain, in Estremadura, 24 miles east of the city of Cáceres on the main highway from Madrid to Portugal (Map: Spain, C 3). The surrounding country is mountainous, but produces wheat, wines, oil, and fruits; live stock is raised. The principal manufactures are chocolate, leather goods, pottery, and delftware. There are valuable forests in the vicinity. The town contains many convents and churches, of which the most famous is that of Santa María de la Concepción, which holds the tomb of Francisco Pizarro (q.v.). The so-called Tower of Julius and other Roman ruins are found in the vicinity. Pop., 1900, 9304; 1910, 11,530.

TRUJILLO, or **TRUXILLO.** An Atlantic seaport of Honduras, situated on the Bay of Truxillo, 137 miles northeast of Tegucigalpa (Map: Central America, E 2). Formerly the most important port of northern Honduras, it has within recent years again become noted for its banana shipments. Pop. (est.), 2000. Trujillo was founded in 1523 and was formerly the capital of the Republic. Here the American filibuster Walker was captured and executed in 1858.

TRUJILLO, or **TRUXILLO.** A Peruvian city, capital of the Province of Libertad, situated near the mouth of the river Moche, 320 miles northwest of Callao, and connected by rail with its port, Salaverry (Map: Peru, B 5). The town is still surrounded by walls of the seventeenth century. It contains a cathedral, a university, and a theological seminary. It was formerly an important commercial centre. It produces sugar, rum, alcohol, tobacco, and coffee. Near it lie the ruins of the Inca city Gran Chimu. Trujillo was founded by Pizarro in 1535, and named in honor of his birthplace. It was destroyed by an earthquake in 1619. Pop. (est.), 15,000.

TRUL'LAN SYNOD. See QUINISEXT.

TRUM'BULL, HENRY CLAY (1830–1903). An American clergyman and author, born at Stonington, Conn., and educated at Williston Seminary, at Yale, and at the University of New York. He was ordained a Congregational minister, served as chaplain of the Tenth Connecticut Regiment in 1862–65, and was in several Confederate prisons. In 1875 he became editor of the *Sunday School Times*. He wrote: *The Knightly Soldier* (1865); *Kadesh-Barnea* (1883); *Principles and Practice* (1889); *Studies in Oriental Social Life* (1894); *War Memories of an Army Chaplain* (1898); *Old-Time Student Volunteers* (1902). *Personal Prayer* was posthumously published (1915). Consult P. E. Howard, *Life Story of Henry Clay Trumbull* (Philadelphia, 1906).

TRUMBULL, JAMES HAMMOND (1821–97). An eminent American philologist, born in Stonington, Conn., and educated at Yale. Feeble health prevented the completion of his college work as well as his entering upon active professional life. After 1847 he was a resident of Hartford. He was Assistant Secretary of State (1847–52), and again (1858–61), and in 1861–65 was Secretary of State of Connecticut. He was well versed in American philology and a writer on historical subjects. He also made a thorough study of the Indian tongues and prepared a glossary of Eliot's Indian Bible. Trumbull was State librarian in 1854–56, and from 1863 until his death was librarian of the Watkinson Library of Hartford; secretary of the Connecticut Historical Society (1849–63), and its president from 1863 until his death. In 1874 he served as president of the American Philological Association. He was one of the editors of the *Colonial Records of Connecticut* (15 vols., 1850–90); he also edited the *Memorial History of Hartford County* (1886); and he prepared an edition of T. Lechford's *Plain Dealing* (1867) and of Roger Williams's *Key into the Indian Language* (1866). His own publications include: *The Composition of Indian Geographical Names* (1870); *The Best Method of Studying the Indian Languages* (1871); *Historical Notes on the Constitution of Connecticut* (1872); *The True Blue Laws of Connecticut, and the False Blue Laws Invented by Rev. Samuel Peters* (1876); *Indian Names of Places in and on the Borders of Connecticut, with Interpretations* (1881); *List of Books Printed in Connecticut 1709–1800* (Hartford, 1904). He wrote numerous articles in his particular fields of study, and also prepared the catalogue of George Brinley's library (1878–97).

TRUMBULL, JOHN (1750–1831). An American judge and poet, born in Westbury, now Watertown, Conn. Precocious in childhood, he passed his examinations for Yale at the age of seven, but spent six further years in preparatory study, and was not graduated until 1767. In 1771 he became tutor at Yale, studied law, and was admitted to the bar in 1773, having already signalized his satiric powers in *The Progress of Dullness* (1772). To this he added a second and third part in 1773, and in that year entered the law office of John Adams in Boston. At New Haven in 1774 he composed the first portion of his most famous satire, *McFingal*, a mock epic after the fashion of *Hudibras*. During the Revolutionary War he lived in Westbury and Hartford, where he completed *McFingal* (1782). This work became very popular, no less than thirty pirated editions being known to collectors. His political writing after the Revolution was Federalist in spirit. His poetical works were collected in 1820. He coöperated with the famous Hartford Wits in the *Anarchiad*, and was State attorney (1789), legislator (1792, 1800), and Superior Court judge from 1801 to 1819, when he moved to Detroit, where he died.

TRUMBULL, JOHN (1756–1843). An American historical and portrait painter. The son of Jonathan Trumbull, Governor of Connecticut, he was born at Lebanon, Conn., June 6, 1756, graduated at Harvard in 1773, and two years later entered the Continental army. Having made for Washington a plan of the British works before Boston Neck, he was appointed an aid-de-camp, and the following year a deputy adjutant general under Gates. He retired from the army in 1777, but in 1778 he took part as a volunteer in General Sullivan's expedition to Rhode Island; and in 1780 he became a pupil of Benjamin West, in London. The news of André's execution fastened upon him the suspicion of being a spy, and he was imprisoned for eight months. In 1782 he returned to America and remained until 1784, when he went back to London to continue his studies under West. Here he painted "Battle of Bunker Hill" (1786), and "Death of General Montgomery" (1786), now in the Yale University Art Gallery. The four pictures, "The Signing of the Declaration of Independence," "Surrender of Burgoyne," "Surrender of Cornwallis," "Resignation of Washington at Annapolis," in the Capitol at Washington, were finished in 1824 after eight years of labor. Most of his pictures he presented to Yale in return for an annuity of $1000. Among the principal ones, besides those mentioned above, are, "Battle of Princeton" (1795), "Battle of Trenton," and portraits of Washington, Hamilton, the Duke of Wellington, and others. In the City Hall, New York, are ten portraits by him, including those of Washington, George Clinton, John Jay, and Alexander Hamilton. The Metropolitan Museum possesses a portrait of Alexander Hamilton, and one of Robert Lenox is in the New York Public Library. Others include General and Mrs. Washington, in the National Museum, Washington; John Adams, Jonathan Trumbull (John Trumbull's father), and Rufus King. His work is good in composition and color, and is pervaded by a healthy realism, but it deteriorated. In 1789 he returned to America and from 1794 he served for seven years under Jay as Secretary of Legation in England. From 1816 to 1825 he was president of the Academy of Fine Arts in New York, in which city he died, Nov. 10, 1843. Consult his *Autobiography* (New York, 1841) and Samuel Isham, *History of American Painting* (new ed., New York, 1915).

TRUMBULL, Jonathan (1710–85). An American patriot and political leader, born at Lebanon, Conn. He graduated at Harvard in 1727, studied for the ministry, and held a pastorate at Colchester, Conn., but in 1731 joined his father in mercantile pursuits. Meanwhile he began to study law, and in 1733 was sent to the General Assembly, becoming Speaker in 1739. In 1740 he was appointed Governor's assistant, holding this position many years; from 1766 to 1769 he was Deputy Governor, and as such ex officio Chief Justice of the Superior Court of Connecticut. From 1769 to 1783 he was Governor, and at the outbreak of the Revolutionary War was the only one of the Colonial Governors who gave unqualified support to the Patriot party. At the close of the war he was prominent as an advocate of a strong federal government. According to a long-accepted tradition he was called by Washington "Brother Jonathan," a phrase which later came into general use to personify the United States. The story, however, seems to be without foundation. See National Nicknames.

TRUMBULL, Jonathan (1740–1809). An American political leader, the son of Jonathan Trumbull (1710–85), born at Lebanon, Conn. He graduated at Harvard, 1759; was for several years in the State Legislature; was paymaster-general of the Northern Department from July, 1775, to July, 1778; and was military secretary to General Washington, with the rank of lieutenant colonel, in 1781–83. He was a Federalist member of Congress from 1789 to 1795, being Speaker of the House in 1791–95; was a member of the United States Senate in 1795–96; was Lieutenant Governor of Connecticut in 1796–98; and was Governor from 1798 to 1809.

TRUMBULL, Joseph (1782–1861). An American lawyer, grandson of Jonathan Trumbull (1710–85). He was born at Lebanon, Conn. After graduating at Yale in 1801, he studied law and from 1804 to 1828 practiced at Hartford. In the latter year he became president of the Hartford bank. He was a member of the Legislature from 1832 to 1848 and in 1851. In 1834–35, on appointment, he served in Congress as a Whig, and again in 1839–43 was a member of that body. In 1849–50 he was Governor of Connecticut. He was actively interested in public internal improvements and in educational matters.

TRUMBULL, Lyman (1813–96). An American jurist and politician, born at Colchester, Conn. He received an academic education, taught school in Georgia, and was admitted to the bar in 1837. He removed to Belleville, Ill., and in 1840 was elected to the Legislature as a Democrat. In 1841–42 he was Secretary of State, and from 1848–53 was a justice of the Supreme Court. From 1855 to 1873 he was a member of the United States Senate. He early joined the Republican party, was chairman of the Judiciary Committee after 1861, supported the Emancipation Proclamation and suspension of habeas corpus, and drafted the Thirteenth Amendment to the United States Constitution. After the war he was one of the seven Republican Senators who refused to vote for the impeachment of President Johnson, and thereafter acted with the Democrats. In 1873 he returned to the practice of law in Chicago. In 1880 he was the unsuccessful Democratic candidate for Governor of Illinois. He joined the Populists in 1894, and defended the leaders of the great railway strike in Chicago in that year.

TRUMPET (OF., Fr. *trompette*, It. *trombetta*, trumpet, diminutive of Fr., OF. *trompe*, It. *tromba*, trumpet, probably from OHG. *trumba*, *trumpa*, Ger. *Trommel*, drum). A musical instrument of great antiquity, which, in its present form, consists of a tube 8 feet long, less in diameter than the horn, doubled up in the form of a parabola, and sounded by a mouthpiece. By means of crooks the instrument can be adjusted to any degree of the chromatic scale. With the exception of the one in C, all trumpets are transposing instruments. The music is always written in the treble clef. The sound is bright and penetrating. The older composers, including Beethoven, had to be careful in the selection of the trumpets for a particular composition, and even then it was not always possible to have the trumpet play all the notes desired. To remedy this defect the instruments were provided with valves, enabling them to produce all chromatic intervals from g to g^3.

TRUMPET, Speaking. See Speaking Trumpet.

TRUMPET CALLS. See Bugle and Trumpet Calls.

TRUMPETER (so called from its note), or Agami. One of the birds of the family Psophiidæ, allied to the cranes, and natives of South America. They have the plumage of the head and neck short and velvety, while that of the rump is long and loose, and possesses the remarkable character of having a series of suborbital bones as in reptiles. The best-known species is *Psophia crepitans*, which occurs in large flocks north of the Amazon, especially in the forests of British Guiana. These birds, of which several species exist, have little power of flight. The flesh is palatable, and they are domesticated by the Indians. Another species (*Psophia leucoptera*) is termed "corcovoda." See Plate of Cranes, etc.

TRUMPETER FISH. An important commercial food fish of New Zealand, *Latris necatia*, often reaching a weight of 50 pounds. It is a member of the longfin family Cirrhitidæ, related to the sea breams (Sparidæ), which furnishes many valuable food fishes throughout the Indo-Pacific region. One species (*Chilodactylus macropterus*) is highly prized both at the Cape of Good Hope and in Australia, and reaches a weight of 25 pounds. These fishes are called "long fins" on account of a prolongation of one of the rays of the pectoral fins. See Longfin.

TRUMPETER HORNBILL. See Hornbill.

TRUMPET FISH. See Snipefish.

TRUMPET FLOWER (so called from the shape of the flower). The popular name of the genus *Tecoma* (family Bignoniaceæ), comprising over 100 species of Asiatic, Australian, African, and North American mostly climbing and twining shrubs without tendrils, producing large flowers with a long tubular corolla which suggested the common name. The trumpet creeper, or trumpet vine (*Tecoma radicans*), is a beautiful North American hardy species which climbs by means of aërial rootlets and has large attractive funnel-shaped orange-yellow and scarlet flowers. *Tecoma australis* is an ornamental Australian climber. *Tecoma jasminoides*, another Australian species, is often grown in greenhouses in cold climates. *Tecoma capensis* is a South African climbing shrub with clustered racemes of orange-scarlet flowers. *Tecoma grandiflora*, a rather tender Chinese and Japanese species, is in common cultivation. *Tecoma stans*, a yellow-flowered Texan species, is an erect shrub. The plants are propagated by seeds, layers, cuttings of well-developed shoots, and most commonly by root cuttings. Species of the closely related genus Bignonia are sometimes also called trumpet flower.

TRUMPET CREEPER (*Tecoma radicans*).

TRUMPET HONEYSUCKLE. See Honeysuckle.

TRUMPET WOOD. See Cecropia.

TRUNK-BACK TURTLE. The leatherback (q.v.).

TRUNKFISH (so called from its incasement, which resembles a trunk), or Boxfish. A fish of the order Ostracodermi, and family Ostraciidæ, with a short, cuboid body, covered by a carapace formed of firmly united polygonal bony scutes, the jaws, bases of the fins, and caudal peduncle free and covered by smooth skin. They swim by means of a curious sculling motion of the small dorsal fins and anal fins, the tail acting as a rudder, while the pectoral fins fan water into the gills. There are about thirty species, all of tropical seas, and dwelling near the bottom, feeding on minute animals. The common trunkfishes, such as the West Indian *Lactophrys trigonus*, have the carapace or "box" three-angled. A somewhat different one (*Lactophrys tricornis*) is the "cowfish" or "toro" of Florida and Cuba, distinguished by the stout spines that form three "horns" on the head. It ranges to the Cape of Good Hope, reaches 18 inches in length, and makes good food when baked in its shell. See Ostracodermi, and Plate of Plectognath Fishes.

TRUN'NION, Commodore. In Smollett's *Peregrine Pickle*, a retired sailor.

TRU'RO. A city in Cornwall, England, 8 miles north of Falmouth, at the junction of the Allen and the Kenwyn with an inlet of the sea called the Truro River (Map: England, B 6). Truro is the centre of a mining district, and trades in tin and copper ore. Its modern cathedral, an early English structure in granite, consecrated in 1887, ingeniously incorporates St. Mary's Church, a Perpendicular edifice of the reign of Henry VII. The grammar school dates from 1546. Anciently called Truera and Truruburgh, Truro was the seat of the Stannary Parliaments of Cornwall, and was a privileged tin coinage town. Pop., 1901, 11,562; 1911, 11,325.

TRURO. A town and the county seat of Colchester Co., Nova Scotia, Canada, on the Canadian Pacific and Intercolonial railways, on the Bay of Fundy, 61 miles by rail north-northeast of Halifax (Map: Nova Scotia, G 6). It contains the Provincial Normal College, the Nova Scotia College of Agriculture, Truro Academy, and nearby there is a 1000-acre park. There are various manufactures. Pop., 1901, 5993; 1911, 6107.

TRURO, Thomas Wilde, Baron (1782–1855). An English jurist and Lord Chancellor. He was born in London, was educated at St. Paul's School, and was trained as a lawyer. In 1805 he was admitted as attorney and for some years practiced as such, but in 1817 was called to the bar as barrister, and in 1820 made himself celebrated by his defense of Queen Caroline. In 1831 he entered Parliament in the Whig interest and gradually won for himself as great distinction there as he had won in the courts. In 1839 he became Solicitor-General, and in 1841 became Attorney-General, but held the office only a few months. In 1843 he introduced Rowland Hill's plan for postal reforms in the House of Commons, in 1846 was again made Attorney-General on the resumption of office by Lord John Russell, and a few days later was appointed Chief Justice of the Court of Common Pleas. In 1850 he was made Lord Chancellor and created Baron Truro of Bowes, but he resigned on the defeat of the government in 1852.

TRUSS (OF., Fr. *trousse*, from *trousser*, to pack, bind, tie, It. *torciare*, to twist, wrap, tie, from Lat. *tortus*, p.p. of *torquere*, to twist). An instrument employed in the relief of hernia, with the view of preventing its descent or of effecting a cure. It consists essentially of a pad or cushion attached to a metallic spring, with straps so arranged that its position may be retained during varied movements of the body. The necessity of having recourse to a suitable truss the moment that slight protrusion shows itself in any part liable to hernia cannot be too strongly urged. Many varieties of trusses have been devised. The instrument required in any particular case should be left to the surgeon. See HERNIA.

TRUSS. In engineering and architecture, a device for spanning a space between supports by means of a number of pieces framed together. Trusses are employed when the space is too great to be conveniently spanned by a single beam or girder. The various pieces or members, of wood or metal, are so proportioned and disposed as to resist most effectively the particular strain or stress of tension or compression to which each is subjected. See BRIDGE; ROOF.

TRUST (ME. *trust*, *trost*, *trist*, *tryst*, Goth. *trausti*, covenant, treaty, OHG. *trôst*, Ger. *Trost*, trust, protection). In its broadest sense, a legal relation existing between two or more persons such that a court of equity will compel one to hold property or an interest in property of which he has the legal title for the benefit of the other or others. The person so holding the legal interest in property is called the *trustee*, and the person entitled to the benefit, or, as is sometimes said, "equitable interest" in the property, is known as the *beneficiary* of the trust, or the *cestui que trust*. The *fideicommissum* (q.v.) of the Roman law, which was a form of trust created by will, has been supposed to have been the model of uses, the early form of trust introduced into England by the clergy as a means of avoiding the operation of the mortmain statutes (q.v.). Another analogy has been found in the Roman idea of *usufructus*, or the right of temporary enjoyment of a thing as distinct from the legal ownership of it. The analogy, however, between uses or trusts on the one hand, and the *fideicommissum* and the *usufructus* on the other, fails in many important particulars, and it seems most probable that the use is an independent product of English jurisprudence, although its development was greatly aided by the doctrines of the Roman law with which the clergy were familiar.

The practice of conveying land to uses, that is, the granting of land to one to be held by him for the benefit of another, seems to have existed as early as the reign of Edward III. Such grants were made by debtors to avoid levy of execution by creditors, and by disseisors to avoid the claims of rightful owners of the land. By thus conveying land to another to the use of the grantor, the grantor retained all the benefits of a purely legal ownership, while he divested himself of all its burdens. First, the obligation of the grantee to uses to hold land to the use of his grantor seems to have had only a moral or religious sanction, and, resting as it did upon conscience and good faith, was a proper subject for the then rapidly growing jurisdiction of the Court of Chancery. (See CHANCERY.) There is some evidence that the Chancellor took jurisdiction to enforce such obligations upon equitable grounds in the reign of Richard II, and the jurisdiction became well established during the reigns of Henry VI and Edward IV. By virtue of the Chancellor's power to command things to be done, he could compel the feoffee to uses to carry out fully the equitable obligations imposed upon him by the grantor, and in the reign of Edward IV we find the Chancellor imposing the same obligations upon those who acquired the legal title from the feoffee by inheritance or by purchase, if the purchaser had notice of the claim of the *cestui que use*. Equity also came to recognize the right or interest of the *cestui* as analogous to a legal interest in the land which might be freely conveyed or assigned and which might be inherited. Thus, in addition to the power of the legal owner of land to divest himself of the burdens of legal ownership by the conveyance to uses, he was also enabled to grant the use in ways not permitted at common law, as, e.g., the grant of the use of property by the husband to his wife.

At this period (Edward IV) there were three recognized methods of creating a use or trust in lands: (1) *By feoffment* or *transmutation of possession*, as already mentioned. Analogous to this was the practice of enfeoffing another to the uses to be declared in the feoffor's will. Equity in such cases compelled the feoffor or trustee to hold the property for the benefit of those named in the feoffor's will. (2) *By bargain and sale.* When the legal owner entered into a legal contract for the sale of land in which the buyer paid, or agreed to pay, the vendee for the land, a court of equity treated the vendor as a trustee and compelled him to hold the land for the use or benefit of the buyer. (3) *By covenant to stand seized.* This was a covenant by which the legal owner of land covenanted to stand seized or possessed of the land to the use or for the benefit of a blood relative. Courts of equity treated such an instrument as a valid declaration of trust, enforceable against the covenantor for the benefit of the relative named in the covenant.

The use of the trust as a means of evading the obligation of legal ownership led to the enactment of the Statute of Uses, 27 Henry VIII, chap. 10. Its purpose was to abolish the practice of creating uses or trusts of land, and its effect was to declare that, by operation of law, the legal title should be deemed vested in the beneficiary or *cestui que use*. Upon its face the statute was effectual to serve this purpose, and its immediate effect was to permit the creation and transfer of legal estates in the same manner as uses or equitable estates had been created and transferred before the statute, and incidentally to permit the conveyance of a legal interest in land by mere deed of bargain and sale without feoffment as at common law. (See CONVEYANCE; USES.) Influenced, however, by the same powerful motives which were responsible for the development of the system of uses, the early lawyers, by a method of reasoning now difficult to understand, ultimately gave to the statute a meaning and effect the exact opposite of that intended. It was held that when land was granted to A for the use of B, the efficiency of the statute to vest the grantee to uses with the legal title was exhausted, so that if the grant was made to A for the use of B for the use of C, then B, who acquired the legal title by operation of the statute, would hold it for the benefit of C. It was also held that when an active duty was imposed upon the grantee to uses or trustee, as by a grant of real estate to A to collect and pay over the rents to B, the use was not executed by the statute by making B the legal owner, but was enforceable by Chancery as before the statute. The result, therefore, was that the system of trusts was preserved and its development stimulated rather than hindered by the statute. In both England and the United States there is a complete system of trusts of both real and personal property, either as developed by courts of equity or modified by statutes.

In order to create a trust all that is now necessary is that one should convey or grant, either by will or by grant *inter vivos*, specific property to one in trust for another, or that one having the legal title to such property should declare that he holds it in trust for another. No consideration is necessary to create a trust, and no writing or other formal document is required, except that trusts of real estate are required by the Statutes of Frauds to be evidenced by writing. No particular words are necessary, but the intention of the person creating the trust must be clear. Any legal person or a corporation if within its corporate powers may become a trustee. Formerly the legal title held by the trustee, according as it was real or personal property, passed upon his death to his heirs or next of kin, whom equity would compel to hold the property for the benefit of the beneficiaries under the trust, but generally by modern statutes provision is made in case of the death or misconduct of a trustee for the appointment by the court of a new trustee, who acquires the title of the first trustee. Any legal person may be a *cestui que trust*, but it has been held upon somewhat unsatisfactory reasoning that trusts for the benefit of unascertained beneficiaries or for the benefit of inanimate objects were invalid, even though the trustee was able and willing to carry out the trust. This rule has been greatly modified by statute, however, thus making it possible both in England and in many of the United States to create a valid trust for indefinite beneficiaries, where the purposes of the trust are charitable. Such is the case of a gift to trustees to apply the income for the benefit of the poor of a certain parish. In general, also, all the rules governing and determining the illegality of agreements are applied by courts of equity in determining the validity of trusts.

Trusts have been classified with reference to the manner of their creation as Express, Implied, Resulting, and Constructive. (1) The express trust is one created by the intent of the person creating or declaring the trust, expressed in written or spoken language, such as the trust created by express clauses in a will or by a formal declaration of trust. (2) The term "implied trusts," which has been sometimes applied to constructive trusts, denotes trusts created by the intent of the person creating or declaring it, when his conduct or language, either written or spoken, is such that the court infers or implies the intention to create the trust. (3) Resulting trusts are trusts which are not created as a consequence of actual intention, but which courts of equity in certain instances treat as trusts intended to be created. As it is said, under certain circumstances, the intention to create a trust is presumed. Thus, if the purchaser of real estate pays the purchase price, but takes the title in the name of a third person, the courts of equity hold that a resulting trust is created in favor of the purchaser, or when one conveys property to a trustee upon a trust which fails or is illegal, a resulting trust is deemed to be created in favor of the grantor, and in many cases when voluntary conveyances or conveyances without consideration are made a resulting trust is implied in favor of the grantor. In some States, notably New York, the rules applicable to the creation of resulting trusts have been modified by statute. (4) Constructive trusts include all those cases not included in the preceding classes in which courts of equity upon some equitable ground will compel the person having the legal title or interest in property to hold it for the benefit of another. Like resulting trusts, they differ from express and implied trusts in that they are not created as a consequence of intention of the interested parties. Thus, whenever the legal title of property has been wrongfully acquired by fraud, the person guilty of the fraud, or any person claiming under him who is not a bona-fide purchaser of the property for value, will be treated as a trustee and compelled to turn the property over to the person defrauded who is a constructive *cestui que trust*. Equity acts in a similar manner in enforcing equitable liens (q.v.) by compelling the lienee to hold the property subject to the claim of the lienor.

The so-called doctrine of tracing trust funds is a special application of the doctrine of constructive trusts. Not only will equity follow property acquired by fraud or breach of trust into the hands of any person who is not a purchaser in good faith for value, but it may compel any such constructive trustee who has disposed of the property to account for its proceeds in his hands, even though the proceeds have in time been converted into other property. As neither resulting nor constructive trusts are created by intention of the interested parties, neither is within the Statute of Frauds requiring the trust to be evidenced by writing. The trustee is, strictly speaking, the legal owner of the property, with all the rights and obligations of legal ownership, subject only to the right of the *cestui que trust* to compel with the aid of a court of equity performance of the trust. The trustee may sue and be sued with reference to the trust property without joining the *cestui que trust*. He may convey it, giving a complete legal title, although he may act in violation of the trust. With reference to the *cestui que trust*, however, he must perform completely the terms of the trust, and he cannot delegate his authority. He must act in good faith and with due care in administering his trust, and for failure to do this he must account to his *cestui*. When he has funds in hand he must keep them properly invested. In many States the investments which a trustee may make are regulated by statute or by settled practice. Aside from his fees allowed by law or specifically granted by the terms of the trust, he cannot make any gain or profit from his position as trustee. In several of the United States, notably in New York, statutes have been passed defining and generally regulating trusts and attempting to some extent to limit the doctrine of trusts as developed by the English Court of Chancery. It may be said, however, that neither by legislation nor otherwise has there been any material modification of the notion of a legal interest vested in one person and held by him for the benefit of another, the obligation to so hold the property being enforced by courts having equity powers. More changes have been made in the direction of substituting one trustee for another with facility in case of death or misconduct of a trustee, and in providing for the accounting of trustees and regulating their acts. Breach of trust or misappropriation of trust funds was not a crime at common law. It is now generally made a crime, being punishable as one of the statutory forms of embezzlement. In New York misappropriation of trust funds falls within the statutory definition of larceny and is punishable as such.

Consult: T. A. Romer, *The Judicial Trustee's Guide* (London, 1898); Thomas Lewin, *Practical Treatise on the Law of Trusts* (11th ed., ib., 1904); Robbins and Maw, *Treatise on the Law Relating to the Devolution of Real Estate on Death* (4th ed., ib., 1908); J. W. Perry, *Treatise on the Law of Trusts and Trustees* (6th ed., 2 vols., Boston, 1911); also the statutes of the various States. See CHANCERY; EQUITY; FIDUCIARY; FRAUD.

TRUST, CHARITABLE. See CHARITABLE TRUSTS.

TRUST COMPANIES. Institutions chartered by the several States of the United States for the purpose of performing, as corporations, the general acts and assuming the general responsibilities imposed upon individuals under the law of trusts. The trust company in the United States exists in various forms, and combines with its trustee business numerous other lines of banking; as, e.g., the private savings bank business in certain States, chiefly in the West; mortgage investment in nearly all States; title guarantee and other insurance; and of recent years a general banking business similar in most respects to that of the ordinary deposit bank.

The growth and extension of trust companies in the United States has been noteworthy in the country's recent financial history. The Comptroller of the Currency, in his annual report summarizing the various banking institutions in the United States, had returns in 1898 from 246 institutions of this class, which number had on June 1, 1905, risen to 683. In 1905, according to the same report, the assets of the 683 companies aggregated $2,865,976,479. In 1915 there were 1660 companies reporting, with assets of $5,873,120,341. On Jan. 1, 1899, there had been incorporated in New York State 49 trust companies, having aggregate resources of $579,205,442. In June, 1905, there were 79 such institutions in existence, with total assets of $1,487,424,480, and in September, 1914, 81 companies with total resources of $1,714,953,823. On Jan. 1, 1898, the deposits of the New York trust companies aggregated $383,328,724. At the opening of 1907 their total was $1,084,376,517. In 1914 it was $1,404,809,646. The loan account, which amounted at the opening of 1898 to $261,765,000, had risen in June, 1905, to $929,640,957. In 1914 it was $787,040,209. At the opening of 1898 investments by trust companies in stocks aggregated in New York State $113,525,797; in June, 1905, such investments had risen to $341,661,738. In 1914 investments in stocks and bonds aggregated $457,774,567.

The trust companies have occupied public interest and discussion chiefly because of the exceptional increase of deposits since 1896–97—a result partly of the general practice maintained by these companies of offering interest on deposits, which has been generally abandoned by banks in the larger cities. The trust companies in New York City offer interest on all deposits at a rate varying from 2 to 4 per cent, according to agreement as to permanency of the deposit. In addition to the amount of deposits thus attracted, the immense credit fund in the hands of the trust companies for loaning purposes has made possible the increase of their deposits, through the making of such loans, at a more rapid rate than heretofore.

The trust companies of New York State may be taken as typical in a study of the problem. The important point to notice in these companies is that the law which created them is acknowledged not to have contemplated the doing of business on precisely the lines now followed by many of the institutions. Seventeen trust companies in New York State were chartered by special act of the Legislature between 1822 and 1887. In the latter year the general trust company law was passed, which, as subsequently amended, is now the basis of authorization for the business of the 60 subsequently incorporated companies. The purpose of the law, as clearly shown in these various enactments, was to create a class of institutions which in their powers, duties, and responsibilities should be able to act as substitute for the individual trustee. The general trust company law of New York State as it now stands authorizes the companies to perform the following functions: (1) To act as the fiscal agent or transfer agent of any State, municipality, body politic, or corporation, etc. (2) To receive deposits of trust moneys, securities, and other personal property from any person or corporation, and to loan money on real or personal securities. (3) To lease, hold, purchase, and convey any and all real property necessary in the transaction of its business, or which the purposes of the corporation may require, or which it shall acquire in satisfaction or partial satisfaction of debts. (4) To act as trustee under any mortgage bond issued by any municipality, body politic, or corporation. (5) To accept trusts from and execute trusts for married women, in respect to their separate property, and to be their agent in the management of such property. (6) To act under the order or appointment of any court of record as guardian, receiver, or trustee of the estate of minors. (7) To take, accept, and execute any and all such legal trusts, duties, and powers in regard to the holding, management, and disposition of any estate, real or personal, and the rents and profits thereof, or the sale thereof, as may be granted or confided to it by any court of record, or by any person, corporation, municipality, or other authority. (8) To take, accept, and execute any and all such trusts and powers of whatever nature or description as may be conferred upon or intrusted or committed to it by any person or persons, or any body politic, corporation, or other authority. (9) To purchase, invest in, and sell stocks, bills of exchange, bonds and mortgages, and other securities. (10) To be appointed and to accept the appointment of executor or of trustee under the last will and testament, or administrator with or without the will annexed, of the estate of any deceased person, and to be appointed and to act as the committee of the estates of lunatics, idiots, persons of unsound mind, and habitual drunkards.

These functions make plain both the nature of the trust company's business as contemplated by the legislators, and its difference from the banking business as conducted by an ordinary deposit bank. It will be observed that the act above quoted does not specifically in any place authorize the trust company to transact a general deposit banking business. But the statute does not deny such powers, and in section 8 it provides that a company incorporated under the act may accept "any and all such trusts and powers, of whatever nature or description, as may be conferred upon or intrusted or committed to it by any person or persons." This is a sufficiently sweeping proviso to cover the doing of banking business in any deposits intrusted to the company by individuals, and on that basis a great part of the trust company business as nowadays understood has been built up.

The question whether the cash deposited with the banks was a legitimate reserve for all purposes has been the bone of contention. The banks have contended that it is not and that the trust companies should be required to maintain in cash an adequate reserve. The trust companies have in general answered that the funds deposited by them with the banks, if they are properly secured by the bank's own reserve, should be a sufficient guarantee against any sudden demands by the trust companies' depositors. In the early part of 1902 this controversy became acute. At that time 27 trust companies in Greater New York used by arrangement the facilities of the New York Clearing House, for the purpose of exchanging and redeeming checks paid into them. Such checks were delivered by the trust company to a bank specified as its clearing-house agent, and by that agent were properly exchanged in the daily clearings. On April 29, 1902, the New York Clearing House adopted the following resolution: "Every institution which hereafter may be granted permission to clear through a member of this association shall be required to keep in its vaults such cash reserve to its deposits as the clearing-house committee may determine. The percentage of such reserve, however, is not to exceed that required of banks, members of the Clearing House Association." The rule did not apply to any of the numerous trust companies at that time actually using the clearing-house facilities. A year later, on Feb. 8, 1903, the following more drastic resolution was adopted by the clearing house: "Every nonmember institution (not a bank required by law to maintain a specified reserve) now or hereafter sending its exchanges through a member of the association shall on and after June 1, 1903, keep in its vaults a cash reserve equal to 5 per cent of its deposits; and on and after Feb. 1, 1904, such cash reserve shall be at least 7½ per cent of its deposits, and on and after June 1, 1904, such cash reserve shall be such percentage as shall from time to time be fixed by the clearing-house committee, but not less than 10 nor more than 15 per cent of its deposits. The reserve hereby required shall be an average reserve as against the average deposits as shown upon its weekly statements."

A vigorous controversy arose as to whether the trust companies should submit to this regulation. It was pointed out that for many of them the clearing-house facilities were not indispensable, and that they could arrange individually for the redemption of checks paid in to them. On the basis of this reasoning 10 trust companies, including several of the largest institutions of the kind in New York City, formally withdrew from the clearing house. Those which remained, numbering 17, acceded to the clearing-house rule and began to build up a cash reserve in accordance with its requirements.

Bibliography. W. H. Hull, editor, *Practical Problems in Banking and Currency* (New York, 1907); Kirkbride and Sterrett, *The Modern Trust Company* (ib., 1908), containing a bibliography; B. J. Downer, *Compilation of Laws Relating to the Trust Companies of the United States* (ib., 1909); G. E. Barnett, *State Banks and Trust Companies since the Passage of the National Bank Act* (Washington, 1911); H. W. Magee, *Treatise on the Law of National State Banks, Including the Clearing House and Trust Companies* (2d ed., Albany, 1914); Clay Herrick, *Trust Companies: Their Organization, Growth and Management* (2d ed., New York, 1915).

TRUSTEE. A person, natural or artificial, acting in a fiduciary capacity towards property, the beneficial ownership of which is in another, generally called the *cestui que trust*. See TRUST and authorities there referred to.

TRUSTEE PROCESS. A legal process used in Massachusetts and several other New England States, corresponding to the garnishee process in use in most jurisdictions. In New York there are two methods by which a judgment creditor may reach the income of a beneficiary under a trust: by use of the usual garnishee process which is made expressly applicable to this situation, but by which only a small percentage of the income may be taken; and by a creditor's bill to apply surplus income to the satisfaction of the judgment, i.e., so much of the income as is not necessary for the living expenses of the beneficiary according to his station in life. See ATTACHMENT and GARNISHMENT, and consult the authorities there referred to.

TRUST-FUND DOCTRINE. A theory adopted at one time by the courts of the United States. This doctrine regarded the entire capital stock of a corporation as a trust fund, held by the directors of the same for the benefit of creditors of the corporation. Based upon this doctrine numerous decisions both of the United States courts and of almost all the State courts in the Union were written which held that unpaid stock subscriptions could not be evaded by the execution of releases by the original subscribers or by cancellation by the corporation itself or by a transfer to third persons made for the purpose of evading payment. Under these decisions corporation creditors could recover the difference between the actual value of property transferred to a corporation in return for stock and the par value of the stock which the corporation issued for the property, which stock is generally referred to as watered. Other results of the application of this theory were the prohibition of a corporation employing its own capital for the purchase of outstanding shares of its capital stock and the illegality of paying dividends out of its capital stock.

The extremes to which this theory was carried in its application to corporation finance eventually brought about a limitation of the doctrine. In 1893 the Supreme Court of the United States questioned its soundness and decided that if the capital stock constituted a trust fund at all, it could be regarded as such only after the corporation had become insolvent and jurisdiction of its assets had been acquired by the courts through receiverships. In the administration of the bankrupt corporation's estate the application of the doctrine was reaffirmed.

The law as to stock subscriptions, watered stock, the purchase by the corporation of its own stock and payment of dividends out of capital remains as it was before the doctrine was criticized. The only effect which the judicial change of attitude towards the original doctrine has had is that the basis of the reasoning arriving at the same conclusions has been shifted from the concept of trust relationship.

The consideration underlying the decisions which have practically nullified the effects of the trust theory is that a corporation, as an entity entirely distinct from its stockholders, holds its property absolutely and that its title cannot be qualified by the actions of these individual stockholders or creditors. The principle of corporate ownership requires that equitable or trust rights should not encumber its possession and disposition of corporate property. However, upon insolvency, the rights of creditors require the application of the trust doctrine to a limited extent in the administration of its estate after possession by the courts. See EQUITY and the authorities there referred to. See also TRUSTS.

TRUSTS. The word "trusts" in this article is used of large corporations or associations of corporations or of individuals mostly engaged in manufacturing, which possess sufficient power to fix the prices of their products, in part at least, on the principle of monopoly. It does not include railways or combinations of railways, or trusts in the technically legal sense.

Industrial Conditions Leading to Formation of Trusts. The trusts are a late development, since, until late in the nineteenth century, industrial conditions were not favorable for their formation. In earlier times organizations possessing monopolistic power were either created by law or secured their power through the possession of some natural advantage, such as the exclusive possession of certain natural resources, as mines, etc., or through the advantage which comes from the exclusive occupancy of positions of advantage in doing their work—railroads, telegraphs, etc. In the modern trust we often find combined with the advantages of great capital and perfected business organization also some of these natural advantages, but they are not the essence of the trust advantage. The chief causes, from the industrial point of view, which have led to the organization of trusts are: (1) The existence of competition which was practically ruinous in its nature, brought about in part by the ease of intercourse between persons in different localities and by the difficulty of withdrawing readily capital once invested in fixed plants. Such competition almost of necessity at times will become so fierce that all parties concerned will fail of making any profit. (2) The possibility of saving industrially many of the wastes which come from the competitive system, provided the interests of the various competitors are harmonized. Without discussing in detail these wastes of competition, there may properly be mentioned the salaries of traveling salesmen, the expense of keeping up expensive show windows, the cost of competitive advertising, the loss from undue extension of credits, the loss of custom which comes from carrying only a partial instead of a complete stock, the loss from the payment of cross freights, the loss from running manufacturing plants to only part of their capacity or part of the time. There may be mentioned also as a gain from combination the saving from standardizing the machinery and from prevention of the waste of time due to stopping and changing machinery, the saving from the most efficient organization of laborers and from managing all plants in an enterprise by the most skillful men instead of having part of them directed by men of meagre ability, the certainty of a regular supply of raw material, and the most efficient use of by-products.

Other Influences as Causes. Aside from the industrial conditions that have led to the organization of trusts, certain other influences are to be noted: (1) The promoters of the large enterprises have in many cases succeeded in making very large profits from the organization. Likewise the financiers who have underwritten the stock have been able to exact very large payment for the risks which they have taken. The immediate personal interest of the promoter and financier has thus been a very powerful factor—sometimes even the most powerful factor—in bringing about the combinations. (2) Governmental favors of various kinds have sometimes tended in the same direction. Although the protective tariff can scarcely be mentioned as a direct cause of the organization of industrial combinations, it is doubtless true that when an industry which otherwise would not have prospered has been first made very profitable by a protective tariff, so that numerous rival establishments have invested large sums of money in it, the consequent rivalry has led to the formation of combinations. It is also probable that in certain instances the protective tariff, by lessening foreign competition, has promised to the promoters of a combination the opportunity for greater profits than could have been anticipated without the existence of the tariff. In this indirect way, therefore, we may well consider the legislative favor of the protective tariff under certain circumstances as an indirect cause of the trust. Similarly the monopoly granted by the patent laws, by copyrights, by trade-marks, and other legislative benefits has led to the organization of some of the great combinations.

Extent of Combination Movement. According to the *Report on Manufactures* of the census of 1900 there were in the United States 185 combinations with 2040 plants. The total capitalization was $1,436,625,910. The total cost of materials used was $1,089,666,334 and the value of the products $1,667,350,949. The total gross value of all manufactured products enumerated in the census was $13,004,400,143. For the purpose of comparison there should be subtracted from this total the value of the products of the hand trades or the mechanical and neighborhood industries, since these are not adaptable to the form of management known as the industrial combination. There remains a total gross product of industries susceptible of combination into trusts of $11,820,784,665. Comparing this with the product of the industrial combinations, it seems that in 1900 the trusts produced nearly 14.1 per cent of the total gross product of the manufacturing industries of the country, as enumerated by the census.

Between 1900 and 1907 occurred a much more powerful movement towards concentration than any that had appeared earlier, and, although the movement was checked by the crisis of 1907–08, it would still appear that the volume of consolidated industry and its proportionate share in the manufacture of the country have increased. But in consequence of the doubt cast upon the legality of the various forms under which trusts are organized and the adverse decisions in the Standard Oil and Tobacco Trust cases, it was deemed impossible in later censuses to secure figures on combinations. Unofficial estimates, moreover, are of no value because of the discrepancies among authorities as to the forms of organization to be included.

Monopoly Character of the Trusts. Many of the trusts are closely connected with natural monopolies which give them a decided advantage over their competitors. It is well known that the Standard Oil combination in its earlier days derived great advantage from the special rebates which it received from the railroads. There is also reason to believe that many other of the later combinations received somewhat similar favors. Ownership of pipe lines also played an important part in building up the power of the Standard Oil Company. The United States Steel Corporation, as well as some of its constituent companies, has made it evident that one of the great advantages possessed by these organizations is the ownership of mines from which they derive a large part of their raw material. Through this ownership of a large percentage of all the available raw material in the country they are able to put their rivals at a decided disadvantage. Certain trusts also may in certain localities control so large a percentage of the raw material that they may readily crush their rivals in those localities, as, e.g., the salt combination in its control of salt wells and mines. The extent to which a trust therefore may in itself be a monopoly depends often to a great degree upon the extent to which it has a monopoly of the raw material of the industry which it seeks to control. The effects of the trusts upon prices and their legal and social status in the community may in many cases depend upon this one factor.

Promoting and Financing. If, as is often the case, the promoter organizes a new company to take over the various plants which he is intending to combine under one management, or to develop some new patent, it has been the common practice for him to issue stock far beyond the actual cash value of the plants under consideration; then to pay for these plants with as much of the stock of the new company as was necessary to secure them, retaining the balance for his own services. In other cases, when the company is organized, the distribution of the stock among the different parties in interest is agreed upon jointly, and the promoter receives a certain percentage of the entire amount as his reward. Inasmuch as he in many cases takes considerable risk, and as the success of the enterprise is practically due largely if not entirely to his initiative, it has at times been possible for him to secure for his reward as high as 20 per cent of the capital of the organization, paid to him in common stock. With such large rewards as are often hoped for and sometimes obtained, it is evident that the interest of the promoter may become a very direct cause for the formation of the trusts.

Scarcely less prominent than the promoter in this regard is the financier. When either a new enterprise is to be started or a combination of existing establishments is to be made, it is usually necessary to raise a considerable amount in cash in order that the new institution may start with capital in hand. Frequently also many of the plants purchased need to be paid for in cash. The stock of the new company is ordinarily the source from which it is desired that such cash should come. Inasmuch, however, as the general public is not likely to take the stock immediately and pay for it in cash, it is desirable that some one be found who will underwrite it, i.e., who will take the stock and agree to furnish in exchange therefor an agreed-upon sum in cash at a certain fixed date in the future. For this service, so speculative in its nature, the financier ordinarily demands and frequently receives very high compensation. In certain instances, which were cited before the United States Industrial Commission, for each $100,000 in cash furnished, the promoter received $150,000 in common stock, while the underwriter, the capitalist, received $150,000 of common stock and in addition thereto $100,000 in perferred.

Capitalization and Overcapitalization. In the trusts organized especially around the year 1900 excessive capitalization was a prominent feature. At that time both the economies of consolidation and the possibilities of monopoly profit were greatly overestimated by the investing public. Thus, the Carnegie Company, having in 1899 assets valued at $75,000,000, was taken by the promoters of the Steel Corporation at a valuation of $492,000,000. Other properties taken by the corporation presented a still wider discrepancy between independent valuation and valuation for purposes of consolidation. Yet the Steel Corporation was, on the whole, one of the more conservatively capitalized corporations of that era.

The disadvantages of excessive capitalization appear to have fallen chiefly to the unwary investor. Quite conceivably a corporation heavily overcapitalized will take a shortsighted view of market possibilities and charge excessive prices in order to pay dividends. But the weight of opinion appears to be that capitalization policy has had very little to do with price policy. Prices have been kept at a high level or have remained at a low level according to estimates of what the traffic would bear.

The abler trust managers have regarded overcapitalization as a weakness and have pursued a policy of "squeezing out water" by putting profits back into the corporation without increase in capital. Thus the Steel Corporation, which in 1902 had water in its stock to the extent of $625,000,000, had by 1910 reinvested surplus profits to such an extent as to reduce water to $281,000,000. The practice has been continued, and by 1916 the water had practically disappeared.

Forms of Organization and Management. While the form of organization of the trust may often not have any material effect upon its economic influence, it is still very frequently true that the form is determined to a considerable extent by the legal institutions of the country, and sometimes the form of organization is of significance not merely from the legal point of view, but also from the economic. In the eighties and nineties of the last century, when the pressure of competition arising from the large amount of capital for investment in the United States had tended to lessen the profits of manufactures, the first effort to lessen this competition naturally resulted in agreements upon prices or in agreements among different manufacturers to divide the selling territory among themselves, or in some other similar form of agreement which left to each establishment complete autonomy as regards its own management, but which brought about some form of an alliance to lessen the competition. Such agreements were usually and more or less accurately called pools. (See POOLING.) This form of agreement (Kartell) is the usual form of agreement in Germany, where the courts uphold such contracts. In recent years the German government has even taken an active part in encouraging the formation of Kartells. The potash Kartell, e.g., was formed under government pressure and its export policy largely determined by government. In Austria similar conditions obtain. The sugar Kartell is essentially a quasi-public institution. In the United States, on the other hand, the courts have very generally held that such agreements were in unreasonable restraint of trade, and in consequence void, as contrary to public policy. The parties to the pools therefore, knowing that they could not be legally bound, frequently violated the terms of the agreements by increasing their output beyond the amount agreed upon, by cutting prices, and by other similar means. To overcome these difficulties the form of the trust was at length invented and put in practice—in the first place by the Standard Oil Company in 1882. Under this form of organization the stockholders of each of the separate companies assigned their stock to a few trustees, giving thus an irrevocable power of attorney. In lieu of the stock assigned the trustees issued trust certificates to the stockholders of the separate companies, and upon these trust certificates profits were divided. All of the earnings from the different members of the company were pooled, and each manufacturer received his due share as evidenced by the certificates regardless of the question whether his establishment were running or closed. The trustees, having in their hands the voting power of all the stockholders, elected whatever persons seemed to them best as officers of the separate companies. In this way the management was absolutely unified and the interests of all parties concerned became one. The courts finally holding that this trust agreement was illegal, the plan was later adopted of organizing a new company which should buy up all of the separate plants of the different companies entering the combination, so that in this way a unified management was secured that was believed to be within the law.

In order that a more convenient form of handling the properties of the different companies might be secured, and that under certain circumstances somewhat greater flexibility of management could be attained, a third form of organization was later adopted which was in many respects quite like that of the earlier trusts. In this form a new company was organized as a stockholding company. This company then bought up all or a large proportion of the stocks of each of the companies coming into the organization, and held these stocks. The officers of the central organization were thus in a position, by voting the stocks of the different companies, to elect the directors and officers of those companies and thus control their policy. By the decisions of the Supreme Court in the Standard Oil Case (May 15, 1911) and the Tobacco Trust Case (May 29, 1911), the power of the government to dissolve such forms of organization was established. The form, nevertheless, is employed by most existing trusts, but only in default of action by the Department of Justice.

Prices. Competitive prices, it is frequently assumed, will in the long run be fixed mainly by the cost of production of that part of the stock which is produced at the greatest disadvantage. Monopoly price, on the other hand, is fixed at that point which will secure to the monopolist the greatest net return. If greater return will be secured by lowering the price and increasing the sales, the price will be lowered. If the net returns will be greater by increasing the price, even though the number of sales be lessened, that policy will be adopted. In technical discussions regarding prices the assumption is usually made of either a régime of free competition or of what is substantially monopoly. In a practical discussion of the effects of trusts upon prices we must recognize that there may be certain monopolistic powers which may enable prices to be raised somewhat above the competitive rate, but which are still not sufficient to enable the trust to fix prices entirely regardless of a potential competition. So, also, this monopolistic power may vary in degree in different industries or in the same industry at different times.

If the economies of industrial combination spoken of before are great, it is evident that without lessening profits prices of the finished product might be placed somewhat lower than those under the competitive régime, or prices of the raw materials used might be raised above those prevailing under the competitive régime without lessening profits. We see, therefore, that it is within the power of the managers of the trusts, provided the trust has been carefully organized in an industry adapted for combination to put prices below the competitive rates in order to drive out competitors, and then if they have secured monopolistic power thereby, to put prices, within certain limits at any rate, above competitive rates.

Whatever may be the theoretic possibilities, however, under the trust system, it is essential to note what has in fact been the result, inasmuch as, in addition to the technical economic powers that have been suggested, the psychological factors of public opinion, of demands of laborers, of the boldness of the managers, etc., may all enter into the problem as factors in price determination. It is impossible to make any valid general statement as to the effect of trusts upon prices. In some cases they have raised prices and in other cases have reduced them. While the trust was still comparatively new the Industrial Commission proved conclusively that in many cases the margin between the price of finished product and the cost of raw material had been raised—a fact indicating that profits had been increased at the expense of either the consumer or the producer of raw materials. But in their later history many of the trusts appear to have become more moderate in their price policy. Possibly on account of their strengthened financial position through the accumulation of reserves, they have taken a broader view of the possibilities of developing markets. It is certain that the fears generally entertained in the early years of the twentieth century of monopolistic extortion have not been justified by experience.

Wages. As indicated in the discussion on prices, so far as the trusts really make savings through their new method of organization, they have a surplus fund which could be used in some way. The United States Steel Corporation raised the average wages of its employees nearly 20 per cent in the 10 years 1902–11. The Standard Oil Company has usually pursued a policy of liberal wages, and the same thing is true of many of the other strong consolidations. It is, however, to be borne in mind that these great aggregations of capital have it in their power to play one body of workers against another, and so of fixing wages and conditions of employment more or less arbitrarily. The Steel Corporation has never recognized unionism, and is generally believed to exert its power to prevent the rise of labor organizations.

Social Effects. It has often been charged that the great corporations and trusts exert a corrupting influence upon legislatures and the courts. It is probable that in individual cases this charge is true. On the other hand, legislatures have not been free from such charges under the competitive system, and it probably would be difficult to prove absolutely that conditions are worse now than they were before the great industrial corporations were formed. The remedy for such an evil would seem to be chiefly in improving the character of our legislatures.

A more significant consideration is whether the trust, by bringing so many individuals under one centralized management, destroys to any material extent the powers of self-reliance and of self-direction on the part of individuals which are naturally developed by the struggles of the competitive system. Opinions differ to a considerable extent on this subject, but there can be no doubt that, although the opportunities for a man to start an independent business in certain lines of industry are lessened, on the other hand the competition for promotion and for positions of responsibility within the combination itself is severer in the case of the great corporation than in the case of the private business or partnership. When a group of two or three partners are managing a business, they may readily give preference to their sons or friends even when the business ability of such persons is not of the highest type. When the interests of thousands of stockholders must be considered, and there are large boards of directors, each feeling that his position depends to a considerable extent upon the success of the business, favoritism cannot be shown to any very great extent.

Legal Position. When a trust or combination is organized, its rights and powers are determined by the ordinary rules of common and statute law applicable to the particular form of organization adopted. That is, if the combination is a trust, its rights and powers are determined by the ordinary rules of law governing trusts; or if the combination is effected by one of the methods of corporate combination, its rights and powers are determined by the general law of corporations. Aside from these questions of the methods of organizing combinations, the trusts raise no peculiar legal issues except that as to their legality when organized.

In ascertaining whether a combination is unlawful at common law, it should be remembered that the mere combination or coöperation of several individuals is not in itself unlawful, and in the case of partnerships and corporations combination of individuals is encouraged by the law. Combination by corporations, however, as has already been indicated, when not authorized by statute, may be such an abandonment or misuse of their corporate franchises as to be illegal under the general law of corporations. In general it may be said that combinations are unlawful per se only when the purpose of the combination is unlawful or against public policy, or when the means adopted by the combination for effecting its purposes are unlawful or against public policy.

The grounds upon which combinations have been held to be unlawful at common law may be somewhat roughly classified as follows: (1) That the contract (when the combination has been effected by contract) is illegal and void at common law because in restraint of trade. (2) That the combination is an unlawful conspiracy, either civil or criminal. (See CONSPIRACY.) Technically the second class includes the first, since there can be no combination without two or more parties to it who are technically guilty of conspiracy where the purpose is to enter into an illegal contract. Since, however, each is recognized as a distinct ground for declaring combinations illegal, the classification may be adopted as both convenient and practical. In the Standard Oil Case the Supreme Court held that the intent of the Anti-Trust Law was to prohibit monopolization, or attempts at monopoly, of interstate or foreign trade, and that the powers of the court under the law were broad enough to reach such monopolization under whatever form it might assume. For a full discussion of the legal doctrines relating to restraint of trade and conspiracy, reference should be made to those topics. (See also MONOPOLY; ENGROSSING; FORESTALLING; REGRATING.) With reference to conspiracy, it may be said that combinations are conspiracies, and therefore unlawful, when the purpose of the agreement or combination is either to do something unlawful or to do something lawful in an unlawful manner. In general, combinations are held to be illegal because of their purposes and methods when they restrain fair competition or create oppressive monopolies.

At common law the remedies of individuals against acts of illegal combination are limited to the recovery of any damage suffered because of the unlawful conspiracy involved in the combination or to the securing of an injunction restraining those joined in the combination from doing some threatened injury to the plaintiff. In either case it is necessary for the plaintiff to show actual damage suffered by him or that the defendant threatened to do some act causing such damage. When the combination is in the corporate form and is acting outside its corporate powers, or its constituent corporations have ceased to act as separate corporations so as to amount to an abandonment of their charters, the State may proceed against the corporate combination or any of the constituent corporations to compel a forfeiture of its charter by quo warranto. There is, however, no other method at common law by which either the State or a private individual could proceed against a combination on the ground that it is illegal and is working a public injury. As a result of agitation upon the subject of trusts, almost all of the United States have adopted statutes or clauses in their State constitutions restraining or prohibiting all contracts, agreements, undertakings, or combinations in restraint of trade or tending to create monopolies, whether such restraint would have been unlawful at common law or not. In general the courts have held that these statutes are constitutional under both State and Federal constitutions, and not in violation of the constitutional provisions against abridging the freedom of contract, depriving citizens of liberty or property without due process of law, or denying them equal protection of the laws. In the interpretation of these statutes, however, the courts have justly regarded them as an innovation upon the common law to be interpreted with strictness and caution. Moreover, the difficulty of giving such legislation its proper effect without making it subversive of established rights of property has to some extent prevented all these restraining acts from having the effect intended. It may be said that the principal test to be applied in determining whether statutes of this class are violated is whether the act or agreement complained of was done with intent to control prices or whether such would be a natural result of the act or agreement. They usually provide that contracts made in connection with such an act or agreement shall be void, and attach penalties for their violation. In some States parties injured by such violations of antimonopoly statutes are given rights of action to recover damages for the injury suffered.

A far more effective agency for restricting the growth of monopoly is the exercise of the power of the several States to control all corporate enterprises within their respective territories. A State may grant to a corporation its charter and power to do business upon such terms as the Legislature may choose, and it is also within the constitutional power of a State to impose any terms, however exacting, as a condition to which corporations created under the laws of other States must conform if doing business within its limits, provided such conditions do not interfere with interstate commerce, the power of regulation and control of which is by the United States Constitution lodged with the Federal government.

A State may thus limit the amount of capital of a corporation organized under its laws; and it may by its charter or general laws existing at the time of its creation limit or regulate its business. In the same manner a State may impose similar or even additional conditions upon all foreign corporations wishing to do business that is not interstate commerce within the State. In this connection, however, it should be remembered that the charter or other legislative authority to a corporation to do business once granted is deemed to be a contract, and that the State is forbidden by the United States Constitution to impair the obligation of contract. See CORPORATION; CHARTER; DARTMOUTH COLLEGE CASE.

It will be seen that the powers of restriction just referred to are limited to corporations and have no application to natural persons or partnerships. The important above-mentioned limitations upon the power of the States to control corporations, coupled with the fact that it has been the policy of many of the States to grant to corporations organized under their laws practically unlimited power, have in effect seriously interfered with any effective statutory restriction of monopolies by the several States.

The Federal government may to some extent restrain monopoly under cover of its constitutional power to regulate interstate and international commerce. Its power in this respect has been deemed to be practically absolute. It cannot, however, be said at this time that the power of Congress to control or restrain the business of individuals, or corporations, by enactments that are not intended primarily for the purpose of controlling or regulating interstate commerce, but for the purpose of restricting, or making unlawful, or assuming control over, a business which is lawful and unrestricted in the several States, is without limitation, since that question has not been definitely and finally determined by the Supreme Court of the United States. Acting under its power to regulate commerce, Congress in 1887 enacted the Interstate Commerce Act, having for its purpose the control and regulation of business carried on by common carriers engaged in interstate commerce. Its particular object was the prevention of unlawful discrimination in rates by common carriers engaged in interstate commerce, which had contributed in a large degree to the growth of monopolistic enterprises. This was followed in 1890 by a statute for the protection of interstate and international trade, commonly known as the Sherman Act (26 United States Statutes at Large, 209).

This statute provides that all contracts, combinations in form of trusts or otherwise, or conspiracies in restraint of interstate or international commerce are illegal, and that all persons participating in such agreement, combination, or conspiracy are guilty of a misdemeanor and subject to a penalty for violation of the act. The statute also provides that all goods in transportation in violation of the act may be seized, and their forfeiture compelled by a proceeding brought in behalf of the government, and that proceeding may be brought by the Attorney-General enjoining all acts in violation of the statute and for the dissolution of contracts entered into in violation of it.

It has been held by the courts that this act does not apply to monopolies created and authorized by a State, but that it is intended to apply to all direct restraints of trade by individuals or corporations, whether such restraints would have been deemed reasonable or unreasonable at common law. The restraint or monopoly need not be complete. The statute is violated if the contract or combination tends to such monopoly. As a consequence of a general belief in the inefficiency of the Sherman Law to cope with the trusts, two complementary measures were enacted in 1914, known as the Clayton Law and the Federal Trade Commission Act. The Clayton Law is chiefly significant because it prohibits various practices, such as price cutting and tying contracts, which appear by economic analysis to facilitate the destruction of competition by the consolidated concern. The Federal trade Commission Law created a commission, more or less after the pattern of the Interstate Commerce Commission, with powers of investigation and with extensive authority to prohibit all forms of unfair competition.

Antitrust laws were enacted by Kansas, Maine, and Michigan in 1889. Other States soon enacted similar measures, and at present some 30 States have laws prohibiting combinations in the form of trusts. In some States, as, e.g., in Ohio and Missouri, these laws are very sweeping. In the latter State persons or corporations convicted under the law are deprived of the right to use the State courts in the collection of debts. Such State laws have, of course, no application to the acts of a single corporation, and, as most trusts are organized under that form, are of limited efficacy. In a number of cases the State courts have, after long-continued prosecutions, succeeded in proving the existence of unlawful combinations. Thus in 1906 the Attorney-General of the State of Missouri was successful in compelling the president of the Standard Oil Company to admit that that company controlled certain concerns doing business in the State of Missouri, apparently in competition with the Standard Oil Company. While existing as quasi-independent corporations under the control of the Standard Oil Company, these concerns were operating in violation of the Missouri Antitrust Law, but no such violation would appear when they openly became constituent parts of the Standard Oil Company. In 1909 the Texas courts succeeded in convicting the Waters Pierce Oil Company, as a subsidiary of the Standard Oil Company, of violation of the State antitrust law and forced the dissolution of the company under the then existing form. The principal effect of such State laws is to bring about changes in the form, but not in the essential features, of so-called trusts.

It is of course possible for a State to exclude from business within its boundaries a corporation chartered in another State; but since no State can prevent the shipping of the goods of such a corporation across its boundaries, the advantage of such exclusion is illusory.

In 1905 an attempt was made by the State of Kansas to prevent the Standard Oil Company from controlling the output of the Kansas oil fields. Three laws were enacted, one declaring pipe lines common carriers—a principle introduced into Federal law by the amended Interstate Commerce Act of 1906—a second prohibiting discriminations on pipe lines and railways, and a third providing for establishing a branch penitentiary in the oil fields, to be used in refining oil. The last measure was subsequently declared unconstitutional by the State Supreme Court. Proceedings to oust the Standard Oil Company from the State under the State antitrust laws were instituted, but were eventually dropped.

In 1913 the Legislature of New Jersey passed seven corporation bills, known as the seven sisters, which had the hearty indorsement of Woodrow Wilson, then Governor of the State. New Jersey had long been known not only for its tolerance of monopolistic corporations, but for laws which offered inducements to them. The result was that many great trusts, against which New York State had legislated, moved across the Hudson and took out incorporation papers in New Jersey. At the beginning of 1913 the corporations incorporated in that State were capitalized at $7,861,499,369. Of course no contemplated measure could be retroactive, and Governor Wilson said: "Every established business can go on without interruption as heretofore, but cannot hereafter expand by the acquisition of the stocks and bonds of other corporations for the purpose of controlling them, and no corporation can in the future be organized to take over, hold, or control other corporations." (New Jersey had been distinguished for the number of its "holding" companies.) The bills passed in 1913 endeavored to fix personal responsibility for the violation of the law upon the directors of offending corporations, and provided that violation should constitute a misdemeanor, i.e., be punishable by imprisonment not exceeding three years or a fine not exceeding $1000, or both. It was sought thus to overcome the difficulty that had been encountered when a trust sheltered itself by the plea that it was not a person, could not do wrong, and could not be punished.

The English government has gone no further in the way of antimonopoly legislation than the old provisions of the common law against monopoly and the somewhat rigid provisions of their corporation act regarding publicity in the promotion and management of companies.

In France the status of the law seems not to be definitely fixed, for although there are statutes existing against combinations to influence prices, and although there have been certain successful prosecutions under this law, notably in the case of the Copper Syndicate, still industrial combinations in the form of joint selling bureaus do exist without apparent legal opposition.

In Germany, contracts for fixing prices, controlling output, or in other ways tending towards the prevention of destructive competition have been upheld by the courts as reasonable, and the restriction of such combinations is apparently limited to those that can be shown to be contrary to public policy. In Austria the government has made efforts to put the combinations under somewhat more rigid supervision, especially for financial reasons, but although there has been considerable feeling against the trusts, as yet comparatively little has been done by either the legislature or the courts, and some very strong combinations have been in existence there for several years. Both in Austria and in Germany, however, government commissions have been studying the subject with reference to further legislation, and, so far as their recommendations go, the inclination is to recognize the combinations as proper, provided they place themselves sufficiently under government supervision and conduct their business so that it will not be considered by the government officials as contrary to public policy.

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TRUXILLO, trōō-hēl'yō. See Trujillo.

TRUX'TUN, Thomas (1755–1822). An American naval officer, born at Jamaica, L. I. Going to sea at the age of 12, he was first an apprentice on an English packet, was subsequently impressed for service on an English frigate, and finally entered the merchant marine. Coming to Philadelphia late in 1775, he was made captain of the *Congress*, the first American privateer sent out during the Revolution. In command successively of this vessel, the *Independence*, the *Andrew Caldwell*, the *Mars*, the *St. James*, and the *Commerce*, he captured numerous prizes, and overcame many vessels more powerful than his own. After engaging for a time in the East Indian service, he was appointed captain in the newly organized United States navy, 1795, and was put in command of the *Constellation*. On Feb. 9, 1799, during the short naval war with France, he captured, with the loss of only two killed and three wounded, the French frigate *Insurgente*. In the following year (February 1) he likewise defeated the *Vengeance*, which, however, after surrendering, managed to escape. The French loss in killed and wounded was 160, the American 39. Subsequently he was put in command of the West India squadron with the rank of commodore. Retiring from the navy in 1802, he lived for a time in New Jersey, and then removed to Philadelphia, where he was sheriff, 1819–1821. He published *Remarks, Instructions, and Examples Relating to Latitude and Longitude, also the Variation of the Compass* (1794). Consult Barnes, *Naval Actions of the War of 1812* (New York, 1896).

TRYON, trē'ôn', Charles Forbes de. See Montalembert, Count.

TRY'ON, Dwight William (1849–). An American landscape painter. He was born in Hartford, Conn., and studied under C. Daubigny, Jacquesson de la Chevreuse, and Guillemet in Paris. Upon his return to the United States he became director of the Hartford School of Art in 1886, later professor of art at Smith College, Northampton, Mass., and finally settled in New York City, spending his summers in Massachusetts. His New England landscapes, simple in composition and somewhat restricted in subject, but with a very personal and poetic interpretation, are frequently shimmering misty effects, with delicate color and fine tonalities. Good examples of his works are to be found in all the important public collections in America, including 27 oil paintings and several water colors and pastels in the Freer collection (National Gallery, Washington), and a "Moonlight" in the Metropolitan Museum, New York. Among numerous prizes he received gold medals from the American Art Association (1886, 1887), at Munich (1892), the Carnegie Institute, Pittsburgh (1898), Buffalo (1901), and St. Louis (1904), and a silver medal at San Francisco (1915). In 1891 he was elected a member of the National Academy of Design.

TRYON, Sir George (1832–93). An English admiral, born at Bulwick Park, Northamptonshire. He was educated at Eton, and entered the navy in 1848. In 1860 he was promoted to commander, and in 1866 to captain. In the following year he showed considerable talent for organization and foresight as director of transports for the Abyssinian expedition. In 1874–77 he was in command of a ship in the flying squadron, and from that time till 1887 served with the Mediterranean fleet. In 1884 he became rear admiral, and in 1889 vice admiral. His appointment in 1891 to the command of the Mediterranean station was a popular one, but there on June 22, 1893, off Tripoli, he was responsible for one of the most terrible naval accidents of modern times. During some manœuvres he ordered the battleships *Camperdown* and *Victoria*, which were proceeding in parallel lines, to turn inward, thus causing the former to ram and sink the latter with great loss of life. He went down with the *Victoria*. Consult C. C. Penrose-Fitzgerald, *Life* (London, 1897).

TRYON, Thomas (1634–1703). An English zealot, known as the Pythagorean. He was born near Cirencester in Gloucestershire, England. He was taken from school before he had learned to read and put to spinning and carding (1643–46), and thereafter till his eighteenth year he tended his father's sheep. He then drifted to London and joined the Anabaptists, but afterward renounced their doctrines, through the influence of the mystical writings of Jakob Böhme (q.v.). At the age of 48 he began a long series of pamphlets, in which he recommended for drink only water, and for food only bread and fruit, with some liberty in the use of butter and cheese. His book on this theme is known as *The Way to Health* (1691), published originally in 1682 as *Health's Grand Preservative*. It may be said by the way that Benjamin Franklin, in his youth, was much impressed by *The Way to Health*, and for a time became a Tryonist.

TRYON, William (c.1725–88). A British colonial governor, born in Ireland. He secured a commission as captain in the British army in 1751, and became lieutenant colonel in 1758. Through his marriage to Miss Wake, a relative of the Earl of Hillsborough, First Commissioner of Trade and Plantations, he was appointed Lieutenant-Governor of North Carolina, June 27, 1764, and succeeded to the governorship, July 20, 1765. Between 1767 and 1771 occurred the insurrection of the Regulators (q.v.), which he suppressed with severity. In July, 1771, he was transferred to New York, where he greatly strengthened the militia. He made a large grant of land to King's College (Columbia). He visited England in 1774, and on his return in June, 1775, found the Colony in rebellion. In October he took refuge on shipboard and remained in the harbor until Howe's entry in September, 1776. In 1777 he took active command of some Loyalist troops, and in June, 1778, was promoted major general in America. In 1780 he made a raid into Connecticut. During the winter of 1779–80 he was in command of the New York District, but returned to England in 1780, and was promoted to the rank of lieutenant general in November, 1782.

TRYP'ANOSOMI'ASIS. See Sleeping Sickness.

TRYP'SIN (from Gk. *τρύειν*, *tryein*, to rub). One of the ferments or enzymes found in the pancreatic juice. Its action is proteolytic, i.e., it acts on the proteids, converting them into peptones. It is most active in an alkaline medium. About 1906 trypsin enjoyed a brief vogue as a cure for cancer, but it was soon discarded. It has also been used in tuberculosis, and as a spray to dissolve the membrane in diphtheritic croup. See Digestion, Organs and Process of, *in Man;* Enzyme.

TRY'SA (Lat., from Gk. *Τρύσα*, now called *Geul-Bashi*). An ancient town, situated on a plateau (2475 feet high) in southern Lycia, a short distance west of Myra. The site is of interest only from the Heroön erected near the end of the fifth century B.C. by a native prince. This is a quadrangular inclosure about 60 by 75 feet, with a door in the south wall. In the northeast corner stood the large sarcophagus, and in the southeast the small booths for the guard and the funeral feasts. The importance of the monument is in its sculptured decorations. Around the inner wall near the top are two rows of sculptured frieze, and a similar decoration adorns the outside of the south wall. Only the sculptures around the door show any trace of Oriental influence; the rest are evidently derived from good Greek models. On the outside are represented the expedition of the Seven against Thebes, a battle between Greeks and Trojans on the right of the door, and on the left battles of the Greeks with Amazons and centaurs. Inside, on the south wall, on the right are Odysseus slaying the suitors and the Calydonian Hunt, on the left a banquet and dance of youths and maidens. On the east wall can be traced the deeds of Theseus, a battle with centaurs, and a banquet. The north wall contains the Dioscuri carrying away the daughters of Leucippus, a hunting scene, and the conflict of the Lapithæ and centaurs. The west wall contains the battle of Greeks and Trojans between the city and the ships, the storming of the city of Troy, and the battle of Achilles with the Amazon. Apparently the artist was influenced by the great painters of the fifth century. The ruins were excavated between 1881 and 1883 by an Austrian expedition, and the sculptures brought to Vienna. Consult Benndorf and Niemann, *Das Heroön von Gjölbaschi-Trysa* (Vienna, 1889).

TS'AIDAM, or **CH'AIDAM,** chī'dăm. See Tibet.

TSAI-FENG, tsī'-fŭng' (Prince Chun) (?–). A Chinese prince regent, brother of Kwang-sü (q.v.) and father of Pu-yi (Hsuan-tung, q.v.), the tenth and last Manchu Emperor of China. He was sent to Germany in 1901 as China's representative to apologize for the murder of Minister von Ketteler during the Boxer Rebellion. In 1908 he was a member of the Commission of Constitutional Reform and the Government Council. On the death of Kwang-sü, Nov. 14, 1908, Prince Chun was appointed She Chang-wang (Prince Regent), to act during the minority of his son, who now succeeded as the Emperor Hsuan-tung. One of the first decrees of the Prince Regent dismissed Yuan Shih-kai (q.v.) from all of his offices and sent him into retirement, as retaliation for his share in the overthrow of Kwang-sü's reforms in 1898. While in office, Prince Chun was liberally inclined and popular, and on Nov. 26, 1911, took the oath to observe the constitution. But his fairly enlightened policy of reform failed to stave off the growing revolt against the Manchus, and on Dec. 6, 1911, he resigned as Prince Regent. His duties were taken over by the then Empress Dowager, and Yuan Shih-kai was recalled from retirement as a last desperate effort to save the monarchy. After the abdication of Hsuan-tung as Emperor, Feb. 12, 1912, Prince Chun retired to Kiaochau (Tsingtau). See China, *Modern History*.

TSAI T'IEN, tsī' tyĕn'. See Kwang-sü.

TSANA, Lake. See Tzana.

TSAR. See Czar.

TSARITSYN, tsȧ-rē'tsĭn. A district capital and one of the most important ports on the Volga, situated in the Government of Saratov, Russia (Map: Russia, F 5). Connected by rail and water with the interior of Russia, Tsaritsyn is the natural outlet for the region of the lower Volga, and to some extent of the region of the Don. The chief articles of commerce are fish, salt, petroleum, grain, lumber, wool, and mustard. The local manufactures are spirits, beer, and machinery. A large gun factory was established there in 1914. The town is poorly built. There is a fine Lutheran church. Pop., 1910, 100,817.

TSARSKOYE SELO, tsär'skô-ye sye-lô' (the Tsar's village). A district town and the summer residence of the Russian Emperor, situated in the Government of St. Petersburg, about 15 miles south of the capital (Map: Russia, D 3). It is a pretty town with extensive parks belonging to the royal residences and villas of the court aristocracy. The Old Palace is characterized by great splendor and contains a fine picture gallery and the celebrated amber room. The Palace of Alexander, built by Catharine II, is less pretentious. Tsarskoye Selo was formerly the seat of the Alexander lycée, where many of the most prominent literary men (including Pushkin) and statesmen of Russia were educated. Pop., 1911, 30,881. The railway line from Tsarskoye Selo to St. Petersburg, constructed in 1838, was the first railway in Russia.

TSCHAIKOWSKY. See Tohaikovsky.

TSCHERMAK VON SEYSENEGG, chĕr'-mȧk, Gustav von (1836–). An Austrian mineralogist. He was born at Littau, Moravia; was educated at the University of Vienna; and in 1868 was appointed a professor in the university and director of the Royal Mineralogical Cabinet. In 1906 he retired. His contributions to the proceedings of the Vienna Academy are numerous, and treat for the most part subjects of crystallography and petrography. He is also a prominent authority on meteorites. In 1871 he established at Vienna the *Mineralogische Mitteilungen*, published since 1878 as the *Mineral-*

ogische und petrographische Mitteilungen. His publications include: *Die Porphyrgesteine Oesterreichs* (1869); *Die mikroskopische Beschaffenheit der Meteoriten* (1883); *Lehrbuch der Mineralogie* (1884; 6th ed., 1905).

TSCHIRNHAUSEN, chĕrn′hou-zen, Ehrenfried Walter, Count (1651–1708). A German scientist and mathematician. He was born and educated at Leyden. He traveled considerably in France, Italy, and Switzerland, and served in the army of Holland (1672–73). Tschirnhausen erected large glassworks in Saxony, where he constructed burning glasses of unusual perfection and carried on his experiments (1687–88). To him are due some valuable discoveries in the manufacture of porcelain. His *Medicina Mentis* (1687) testifies to the philosophic tendency of his thought. In mathematics Tschirnhausen is known as the founder of the theory of catacaustics, or caustics by reflection. The original articles appeared in the *Acta Eruditorum* from 1682 to 1698. These publications contain also his work on equations and quadratics. In connection with the latter he invented the quadratrix (see Quadrature) known by his name. Consult Weissenborn, *Lebensbeschreibung des Tschirnhausen* (Eisenach, 1866).

TSCHISTOPOL. See Tchistopol.

TSCHUDI, chōō′dē, Ægidius or Gilg (1505–72). A Swiss chronicler, known as the father of Swiss history. He was born at Glarus, studied at Basel, Vienna, and Paris, and after holding several administrative offices entered the French army in 1536, serving till 1544. Once more he held office in various cantons and became, in 1558, chief magistrate of Glarus. He was a bitter opponent of the Reformation and sought to check the spread of the new doctrines by arms. This brought him great unpopularity and necessitated his temporary absence from the canton. During his last years he took little share in political affairs, and devoted his time to a study of the amount of historical material which he had gathered from the public archives and the libraries of monasteries. His *Die uralt wahrhaftig alpisch Rhetia* was published at Basel in 1538, but his great works, the *Schweizerchronik, or Chronicon Helveticum,* and the *Gallia Comata,* did not appear till more than one hundred and sixty years after the author's death. The *Schweizerchronik* covers the period 1100–1470, and is valuable for the large number of original documents incorporated in the text. The *Schweizerchronik* has remained a great source for Swiss history. The *Gallia Comata* is in nature antiquarian, and was intended as an introduction to the *Chronicon Helveticum.*

TSCHUDI, Clara (1856–). A Norwegian author, born at Tönsberg. Intending to become a dramatic singer, she studied at Dresden and Berlin, but presently turned her attention to literature, and after publishing some works bearing on women's rights, such as *Kvindebevægelsen* (1885) and *Tre Nutidskvinder* (1887), became known through the historical portraits *Eugenie Keiserinde af Frankrig* (1889; new ed., 1906), *Keiserinde Augusta, Skildringer fra Hoflivet i Berlin* (1892), *Marie Antoinettes Ungdom* (1894); *Marie Antoinette og Revolutionen* (1895–96); *Napoleon's Moder, Silhouetter, Reiseminder, og Skizzer* (all 1898); *En Sommerfest i Trianon* (1903); *En Forglemt Heltinde* (1904); *Ludwig II of Bayern* (1905–06).

TSCHUDI, Friedrich von (1820–86). A Swiss scholar, brother of Johann Jakob von Tschudi. He studied theology first at Schaffhausen, then at Basel, Bonn, and Berlin; and was made pastor of Lichtensteig in 1843, but resigned in 1847. He settled in Saint-Gall, where he wrote, under the pseudonym of C. Weber, *Der Sonderbund und seine Auflösung* (1848), and under his own name several agricultural studies and the often reëdited and frequently translated *Das Tierleben der Alpenwelt* (1853; 11th ed., 1890). He held several official posts, and was distinguished for his services to education.

TSCHUDI, Johann Jakob (1818–89). A Swiss naturalist, born at Glarus. He studied at Swiss, French, and German universities, and then traveled extensively in South America, visiting Peru (1838–43), and Brazil, the Plata States, Chile, and Bolivia (1857–59). From 1860 to 1862 he was Swiss Ambassador to Brazil, and in 1866 became diplomatic representative at the court of Vienna, retiring in 1883. He published: *System der Batrachier* (1838); *Untersuchungen über die Fauna peruana* (1844–47); *Peru, Reiseskizzen* (1846); *Die Kechuasprache* (1853); *Antigüedades peruanas* (1851), with Don Mariano de Rivero; *Reisen durch Südamerika* (1866–69); *Ollanta,* an ancient Peruvian drama out of the Quichua language (1875).

His son Hugo (1851–1911), born at Jakobshof, Austria, studied in Vienna jurisprudence and art history, and after extensive travels through Europe became connected with the royal museums in Berlin in 1884 and was appointed director of the National Gallery in 1896. Besides numerous important essays in various art periodicals, he published, in collaboration with Pulszky, the text to *Die Landes-Gemäldegallerie in Budapest* (1883), and with Bode, *Beschreibung der Bildwerke der christlichen Epoche in den königlichen Museen zu Berlin* (1883). After 1894 he edited the *Repertorium für Kunstwissenschaft* (Stuttgart, 1875 et seq.), conjointly with Thode.

TSENANFU. See Tsinanfu.

TSÊNG KI-TSEH, tsŭng′ kē′tsĕh′ (1837–90). A Chinese statesman and diplomat, better known as the Marquis Tseng, born in Hunan. He served under his father as secretary, and in 1877 succeeded to the paternal title. In the following year he was appointed Minister to Great Britain and France. In 1880 he was further intrusted with an embassy at St. Petersburg (Petrograd), and there negotiated the treaty by which Kulja was restored to China. In 1881 he was created Vice Director of the Imperial Clan Court, and Vice President of the Board of War, and in 1885 arranged a convention with Great Britain in regard to the opium traffic, and was appointed Assistant Director of the newly established Admiralty Board. In 1886 he returned to Peking, became a member of the Tsung-li Yamen (q.v.) (now the Waichiaopu), and in 1887 Vice President of the Board of Revenue. He was director of the Tung Wen Kwan, or Peking School of Languages (1889–90).

TSÊNG KUO-FAN, tsŭng′ kwō′fän′ (1811–72). A Chinese soldier and statesman, descendant of the philosopher Tseng (Cincius), and born in the Province of Hunan. In 1843 he became chief literary examiner, and later was appointed military examiner. In 1850 he built a fleet of war junks with which he attacked the Taiping rebels. He made a brave defense of Changsha, and the rebels lost 80 days in vainly trying to capture the city. Later Tseng captured Wuchang and Hanyang, and in reward for this was made Vice President of the Board of War. He won other military successes, cleared Kiangsu of the rebels, and in 1857 received chief command in Chekiang. Three years later he was made Viceroy of the two Kiang provinces and Imperial War Commissioner. In 1864 he captured Nanking, and was rewarded with the title of *Hou*, or Marquis. He was less successful in the suppression of the Nienfei Rebellion and was succeeded in the chief command by Li Hung Chang (q.v.), who had been one of his lieutenants. Tseng was Viceroy of Chihli at the time of the Tientsin massacre in 1870. His collected writings of 156 books were edited by Li Hung Chang in 1876. Tseng's son, Tseng Ki-tseh (died 1890), was the first Chinese Minister to Great Britain.

TSERKLAES, tsĕr′kläs, Johann. See Tilly.

TSETSE (tsĕt′sĕ) **FLY** (South African name). A biting fly (*Glossina morsitans*) of the family Muscidæ, related to the common stable fly (q.v.), which occurs in portions of Africa. The tsetse fly bites all warm-blooded animals, but seems particularly attracted to cattle and horses. Its bite was formerly considered poisonous, and apparently produced death in beasts of burden coming from regions where the fly does not occur. The disease produced by the bite is called nagana. Animals which have once recovered appear to be immune, or "salted." It has been determined that the bite of the tsetse fly is not specifically poisonous, but that the insect acts as the carrier of a hæmatozoan parasite, taking it with the blood of diseased animals and carrying it to non-immunes. The tsetse fly does not lay eggs, but multiplies by producing, one at a time, full-grown larvæ which immediately change to pupæ, just as do the so-called pupiparous Diptera. It was at one time supposed that the tsetse fly would form a serious obstacle to the settlement of Africa, but this is not the case. Only certain animals are affected, and the fly acts simply as a carrier; moreover, cattle became immune after residence in infected regions.

TSETSE-FLY DISEASE. See Sleeping Sickness.

TSHI, tshē, or **CHWI.** A negro people on the African Gold Coast. See Sudan.

TSIMSCHIAN, TSIMSHIAN. See Chimesyan.

TSINANFU, chē′nä′fōō′, **TSENANFOO**, or **TSINAN.** A city of China, capital of the Province of Shantung. It lies in a large fertile plain, 3½ miles south of the Yellow River, 245 southeast of Peking (Map: China, L 4). The walls of the city proper have a circuit of 12 miles and are well built, but there is a large extramural population protected by a great encircling mud rampart. The principal streets are comparatively clean, and are lined with good shops. The city is noted especially for its silk brocades, its trade in precious stones, and the varied glass and other products of Poshanhien, the chief city of the "black country" of Shantung. It has a drum tower, a great examination hall capable of accommodating over 10,000 candidates, many fine temples, a Roman Catholic cathedral, besides the Yamens, or offices of the Governor and the high officers of the province. In the western part of the city are several geyser-like springs said to be connected with similar springs in Taishan (q.v.), some 60 miles distant. A splendid highway connects the city with the Hoang-ho, 4 miles to the north. A few miles east of the city are several important iron mines. Pop., 300,000, including 2000 Mohammedan families. Tsinan is on the railway line projected by the Germans from Kiaochow (Tsingtau) through Shantung Province, and this railway was taken over by the Japanese with the capture of Kiaochow. The foreign settlement is beautiful and well kept, and contains some flourishing business firms, mainly German.

TSINGTAO, tsing′tou′, or **TSING-TAU**, a city in China. See Kiaochow.

TS'ING-TU, or **JŌDŌ.** The Chinese and the Japanese names respectively of "The Land of Bliss," sometimes called the "Paradise of the West," presided over by Amitabha (or Amida) Buddha, rebirth in which is promised to all who put their faith in Amida. Life is there practically eternal, free from pain and misery, and as it can be reached without the performance of works, its attainment has become the aim of the adherents of the Ts'ing-tu sect of Buddhists in China, and the Jōdō and Shinshiu sects of Japan. Nirvana is too difficult. Consult J. Edkins, *Chinese Buddhism* (London, 1880).

TSITSIHAR, chē′chē′här′. The largest, the most northerly, and the most thinly populated of the three provinces of Manchuria (q.v.), known to the Chinese as Heilungkiang, and containing about 190,000 square miles (Map: China, N 2). It is generally mountainous, covered with forests, and abounds in both large and small game, and hunting and trapping are extensively carried on. In the southwest are great prairies occupied by the Mongols, who maintain large herds of cattle, horses, etc., upon them. The climate is severe, the mercury falling in winter to 40° F. below zero, and lower. In summer it sometimes rises to 90° F. and 95° F. Agriculture is chiefly confined to the river valleys, where are produced pulse, maize, millet, tobacco, wheat, sesamum, and the poppy. The drainage is to the north through the Sungari. Gold is found in the northwest, north, and east, and is mined at Moho. Much soda is produced and exported to China. The province is crossed by the Trans-Manchurian branch of the Russian Trans-Baikal Railway, which connects at Harbin with the Japanese Railway that runs south-southwest to Port Arthur and Dalny. The population, estimated at 1,500,000, consists of Manchus, Korchin Mongols, Solons, Yakuts from Siberia, 6600 families of whom settled on the banks of the Nonni in 1687, and Chinese, chiefly from the northern provinces. The government is military, but there are two civil officials in as many localities where the population is largely Chinese. Besides the Bannermen a force of 7000 foreign-drilled Chinese troops is maintained. Tsitsihar has long been a penal colony, and there is much brigandage. The capital, Tsitsihar, on the Nonni, was built in 1692 in order to overawe the neighboring tribes. It is a few miles north of the Trans-Manchurian Railway, and is a dirty, poorly built city with a population of between 30,000 and 40,000. It has a great trade in cattle, and the cattle fairs draw thousands of Mongols to the city, at which time the population is almost doubled. See China; Manchuria.

TSONEKAN, tsō'nā-kan, or **TZONECA**, also Chonek. A name sometimes applied to the Patagonian natives. The term Tsonekan is now used to designate the linguistic stock to which the Tehuelches (q.v.) belong. See Indians, *Linguistic Map*.

TSONG KHA-PA, tsông' k'hä'pä', **TSONG-K'A-PA**, or **TSON-K'A-PA** (the man from Tsong-k'a); generally spoken of as Jé-rim-po-ch'ę (c.1355–1419). A noted Tibetan reformer of Lamaism (q.v.). He was born at Tsong-k'a, in the Province of Amdo, near the Chinese frontier, and while still a child he was devoted by his parents to a religious life. At 16 he began theological studies and a year later proceeded to central Tibet. In southern Tibet he spent eight years as a hermit and became convinced of the need of reform. Identifying himself with the *Kah-dam-pa*, "The Sect bound by the Orders" (of the *Vinaya*, or "Books of Discipline"), which had been purified and reformed by the Indian monk Atísha in the eleventh century, he reorganized it, and gave it the name of *Ge-lug-pa*, "The Followers of the Virtuous Order." In 1409 he built the great monȧstery of Gah-ldan ("Paradise"), 25 miles from Lhasa (q.v.); where he preached regularly, and by the time of his death his followers numbered over 30,000 in Lhasa alone. His reforms consisted in a stricter observance of the 235 rules of the *Vinaya*, or "Discipline," a life of ethical purity, strict celibacy, simplicity in dress, the abandonment of the red robes which had become common, and the readoption of the yellow hat and the patched yellow robes worn and prescribed by the Buddha. He also reinstated the fortnightly "disburdenment," or rehearsal of the *Pratimōkṣa Sūtra* in regular assemblies of the order at Lhasa, and restored the custom of retiring yearly for meditation. Tsong Kha-pa was buried in the Gah-ldan, where his embalmed remains form the chief object of veneration.

TSO TSUNG-T'ANG, tsō' tsŭng't'-ăng' (1812–85). A Chinese general and administrator. He was born at Hiangyin, in Hunan, secured his second or master's degree in 1832, and during the earlier years of the Taiping Rebellion served in Hunan and Hupeh. In 1861 he had the command of the army operating in Chekiang, and in the following year was also made Governor of that province. In 1863 he was also appointed Governor-General of the combined provinces of Chekiang and Fukien, and by October, 1864, he had entirely recovered Chekiang and was rewarded with an earldom. When the rebellion ended in 1865 he was also in command of Kiangsi and Kwangtung. Appointed in 1866 Governor-General of Shensi and Kansu, then in the hands of the Mohammedan rebels, he first turned his attention to the Nienfei insurgents, drove them from the neighborhood of Hankow, entered Shensi and defeated them there in 1867, and utterly routed them near Tientsin in August, 1868. He returned to Shensi, pacified that province in 1869, drove the rebels beyond the Great Wall, and captured Suchow in Kansu in 1873. In 1875 he was appointed Imperial Commissioner for Turkestan, and in April, 1876, he advanced with the main body of his army beyond the Great Wall, crossed the desert of Hami, and by Oct. 10, 1877, had captured in succession Urumtsi, Tihua, Manas, Pidjan, Turfan, and Kuche, north of the Tian-Shan; and by Jan. 2, 1878, Harashar, Aksu, Kashgar, Yarkand, Yengishar, and Khotan—all in eastern Turkestan, south of the Tian-Shan—had been reconquered, and the campaign brought to a close. Tso was made a marquis and received many other honors. On his return to Peking in 1881 he became a member of the Tsung-li Yamen (now the Waichiaopu), and immediately succeeded in having all the Chinese students in the United States recalled. In the same year he was transferred to Nanking as Governor-General of Hunan and Hupeh, whence in 1884, on the outbreak of French hostilities in connection with the Tongking affair, he was ordered to Fuchow to direct the military operations, and died there in the following year.

TSOWHIEN, tsou'hyĕn'. A small district or prefectural city of Shantung, China, noted as the birthplace of Mencius (q.v.) and the home of his descendant and representative. It is about 15 miles east of Kiuhfow (q.v.), the birthplace of Confucius, and in a region of great historic interest, hallowed to followers of these two early sages. There is a temple in honor of Mencius, and south of the city is his tomb, approached by a fine avenue of cypress and yew.

TSU, tsōō. The capital of the Prefecture of Miye, central Hondo, Japan, situated on the east coast, 47 miles south-southwest of Nagoya (Map: Japan, E 6). It has a number of fine temples, of which that of Ko-no Amida attracts many pilgrims. Pop., 1898, 33,287; 1908, 41,229.

TSUNG-LI YAMEN (or Yamun), tsōōng' lē' yä'mŭn' (Chin., general managing office). The office or bureau through which the foreign ministers in China until recently communicated with the throne and the six departments of government. It was established in 1861 as one of the conditions of peace with the Powers, and was organized by Prince Kung (who became its first president) in conference with Sir Frederick Bruce, the first British Minister, and comprised between 8 and 12 members. In 1901 it was superseded by the Wai Wu Pu, or Department of Foreign Affairs, which was later known as the Waichiaopu.

TSURUGA, tsōō'rụ-gȧ. A seaport of the Province of Echizen, Japan, about 50 miles north of Kioto, with which it is connected by rail (Map: Japan, D 6). It stands at the head of a deep bay, and is well situated for trade with Korea and Manchuria. Its harbor is protected by a breakwater and a lighthouse, and is the best on the northwest coast of the main island. Junk building is the chief industry. It contains one of the oldest Shinto temples of the country. Pop., about 1700.

TSURUOKA, tsōō'rōō-ō'kȧ, or **TSURUGAOKO**. A town in the Prefecture of Yamagata, north Hondo, Japan, 75 miles north-northeast of Niigata (Map: Japan, F 4). It was formerly a castle town. Pop., 1908, 21,056.

TSUSHIMA, tsōō'shē-mä. An island of Japan, commanding the south entrance to the Sea of Japan, less than 50 miles south of Korea, and separated from the island of Kiushu by Krusenstern Channel (Map: Japan, A 6). It is penetrated by a deep inlet on the west, which at its narrowest is only 16 yards wide. At high water the narrow connecting spit is overflowed, forming two unequal islands. They are both mountainous, with peaks ranging from 1128 to 2130 feet above the level of the sea. Area, 266 square miles. The northern or larger island is indented with many fine bays, and the chief coast town is Waniura. Fishing is the chief industry and dried cuttlefish the chief export. The chief city, Idzunohara or Fuchu, on the south island, has a population of about 10,000. Pop., 39,000. Korean blood is very noticeable among the inhabitants. Near Tsushima Admiral Togo destroyed the Russian fleet under Admiral Rozhdestvensky, May 27–28, 1905. See Russo-Japanese War.

TUA, to͞o'ȧ, Teresina (1867–). An Italian violinist, born in Turin. Her principal teacher was Massart of the Paris Conservatory, under whom she made such rapid progress that in 1880 she won the first prize. She was uniformly successful from the beginning of her artistic career. In 1891 she retired from the concert platform owing to her marriage with Count Franchi-Verney della Valetta, but in the autumn of 1895 she again took up her concert work and made very successful European tours.

TUAILLON, tụ'ȧ'yôɴ', Louis (1862–). A German sculptor. He was born in Berlin and studied there at the Academy and under Begas. After visiting Vienna he spent 17 years in Rome (1885–1902), and after his return to Berlin was appointed director of a master studio at the Academy (1906). Tuaillon revived the half-nude statue of the Roman classical age and achieved great success with his austerely beautiful bronze "Amazon on Horseback," now before the National Gallery, Berlin (replicas in the Thiergarten, Berlin, and in the Metropolitan Museum, New York). Other works in the same style are "The Horse Trainer" (Bremen), "The Victor" (Wannsee), and the half-nude equestrian statue of the Emperor Frederick (Bremen). He received gold medals at Berlin (1899), Dresden (1889), and Paris (1900).

TUAMOTU, to͞o'ȧ-mō'to͞o, **PAUMOTU**, pä'ụ-mō'to͞o (Low or Dangerous Archipelago). A group of low coral islands in Oceanica, lying east of the Society Islands (Map: World, L 7). It consists of 80 islets, of which 42 are inhabited, with a total area of over 335 square miles, of which 270 square miles may be cultivated at least to the extent of growing coconuts. Owing to the coral surface and scarcity of water the vegetation is scanty. In the western islands are found the breadfruit tree, banana, and pineapple. The chief products of the group are copra, trepang, coconut oil, and pearls, and the trade is chiefly with Tahiti. The inhabitants are Polynesians, and mostly Roman Catholic Christian, and in 1911 numbered 3715. The principal port and seat of administration is Fakarava, on the western island of Fakarava. The group was discovered by the Spaniard Quiros in 1606 and visited by many explorers, including Cook (1769). It came under the protection of France in 1844, and was officially annexed in 1881. Consult Friederici, *Ein Beitrag zur Kenntniss der Tuamotu-Inseln*.

TUAREGS, to͞o-ä'rĕgz. Berber nomads in the Middle Sahara, numbering some 300,000, and perhaps descendants of the ancient Gætulians. (See Gætulia.) In various places they have mixed with negroes. They are tall, with slender figures and regular features, dark in complexion, with an occasional blond, and, owing to their frugal diet, are long lived. The costume varies with location, but a common article of dress is the litham, a cloth wrapped about the face to protect the eyes and breathing organs from the dust of the desert. The Amoshagh or Noble Tuaregs wear a black litham and the Imghad or servile a white one, which gives rise to the epithets Black Tuaregs and White Tuaregs. Their weapons are a long, straight sword, a dagger, a spear 6 feet long, and occasionally a gun. They were monogamists until the Mohammedan conquest, when they began to vary somewhat in this respect. The women have freedom, go unveiled, and take part in public affairs.

Bibliography. Emile Masqueray, *Dictionnaire français-touareg* (Paris, 1893–95); W. J. H. King, *Search for the Masked Tawareks* (London, 1903); M. Cortier, *D'une rive à l'autre du Sahara* (Paris, 1908); Jean Camille, *Les Touareg du Sud-Est* (ib., 1909); C. Aymard, *Les Touareg* (ib., 1911); M. Delafosse, *Haut-Sénégal-Niger* (ib., 1912); F. De Zeltner, "Les Touaregs du Sud," in *Journal of Royal Anthropological Institute* (London, 1914). See Niger, Military Territory of the.

TUAT, to͞o-ät'. A group of oases in Algerian Sahara, north Africa, comprising the oases of Gurara and Tidikelt. It is a comparatively well-settled region and abounds in date palms. It is watered principally by the Wadi Saura or Mzaud and also by some subterranean watercourses. The largest lake is the Sebkha Gurara. Pop., 1906, 49,873, of whom 134 were Europeans, the remainder being Tuaregs, negroes, and Arabs. Tuat was formerly regarded as a dependency of Morocco, but with its occupation by French troops in 1900 has practically become a part of the French sphere of influence. It was connected by road with the Algerian railway system in 1903 and by rail in 1912.

TUATARA, to͞o'ȧ-tă'rȧ (Maori, spiny). A reptile of New Zealand (*Sphenodon* or *Hatteria punctatus*), which looks like a large stout lizard, but whose structure shows it to be the sole surviving representative of a primitive group, the *Rhynchocephali*, otherwise extinct in the Triassic age. Large males reach a length of 2½ feet, are dark olive green, and have a row of short, yellowish, horn-sheathed spines along the vertebral line. The skin is granular, except on the belly, where it is scaly. All its anatomy distinguishes this animal from lizards and allies it with the ancient *Prosauria*—the carpus, e.g., has the primitive number of 10 bones, all separate; and there is an entire absence of external copulatory organs.

The tuataras were once numerous through New Zealand, but have been killed by civilization and bush fires, until now they inhabit only some small parts of the North Island. They dwell in burrows of their own digging, which they share with sundry petrels. They are fond of water, and are able to remain submerged for hours without breathing. During the day they sleep, but at night hunt for food, which consists of insects and worms in the interior and on the coast of small fishes, crustaceans, etc.; all food is taken alive. They move very slowly and lazily, but are fierce fighters when called upon to defend themselves. They lay in summer about 10 eggs, elongated and hard-shelled, which are buried in warm sand and left to hatch; but this does not happen until about 13 months later, although the embryos grow to nearly their full size in half that time or less, and then seem to æstivate. Consult: *Transactions of the New Zealand Institute*, vols. x, xiv (Wellington, 1878, 1881); Hans Gadow, "Amphibia and Reptiles," in *Cambridge Natural History*, vol. viii

(New York, 1901); E. G. Boulanger, *Reptiles and Batrachians* (ib., 1914); Newman, in *Transactions Zoölogical Society*, vol. xv (London, 1897).

TUATHADEDANAAN, tōō-ä'thȧ-dȧ-dȧ-nän' (Ir., Race or Tribe of Danaan). A prehistoric people of tall stature and blond type, who, according to the ancient annals of Ireland, invaded the island from the north several centuries before the Christian era, and by defeating the Firbolgs (q.v.) in the battle of Moytura became masters of the country until in turn overcome by the Milesians (q.v.). They were probably of Scandinavian origin.

TU'BA (Lat., trumpet). A name given to the bass instruments of the saxhorn family, also called bombardons. Tubas are made in many keys, and, as they are played from the notes as written, they require no special transposition. They are the lowest of the bass instruments and their range is from $_1$B♭ to f^3. Their tone is full and majestic; the most usual sizes are the bass tuba in B♭ and the contrabass tuba in $_1$B♭. Their introduction into the orchestra is due to Wagner, who obtained fine effects through them. The tuba has since then become a fixture in the orchestra, being used as the bass of the trombone choir. As such it has entirely superseded the ophicleide (q.v.). The instrument is built in two forms, oblong and round. See HELICON.

TU'BAL-CAIN'. According to the narrative in Gen. iv. 22, the son of Lamech and Zillah and the instructor of all artificers in brass and iron.

TUBE NOSE. A tube-nosed or harpy bat (q.v.), a small East Indian fruit bat of the genus *Harpyia*, remarkable for the fact that the nostrils are in the form of two extended and somewhat divergent tubes projecting above the upper lip.

TU'BER (Lat., swelling, tumor, knob on plants). A thickened and shortened branch from a subterranean stem. The leaves are usually reduced to minute scales with buds in the axils, forming in the potato the so-called eyes. It serves as a food reservoir, and also gives rise to new plants much more rapidly than do seeds. See STEM.

TU'BERCLE (Neo-Lat., from Lat. *tuberculum*, little swelling, pimple, tubercle, diminutive of *tuber*, swelling, tumor, knob on plants). A round, solid nodule on the skin, mucous membrane, or surface of an organ, as in leprosy or tuberculosis. In anatomy a rough elevation for attachment of muscle or ligament. See BACTERIA; DISEASE, GERM THEORY OF; LEPROSY; SERUM THERAPY; TUBERCULOSIS.

TUBER'CULIN, KOCH'S LYMPH, or PARATOLOID. A glycerin extract of pure cultures of the Bacillus tuberculosis, first prepared in 1891 by Robert Koch (q.v.). Several preparations of tuberculin are made. Old tuberculin (Koch's original preparation, T. O.), a filtered glycerin extract of tubercle bacilli, is a clear, amber fluid. Tuberculin filtrate, known also as "tuberculin Denys" (B. F.) or bouillon filtrate, is made from bouillon cultures of the human bacillus filtered through porcelain. New tuberculin (T. R.) is a glycerinated saline suspension of the major part remaining after centrifugalizing desiccated and pulverized tubercle bacilli. Purified extract is a filtered culture of human bacilli in 50 per cent glycerin. Tubercle bacillus emulsion, or bacillary emulsion, is a glycerinated suspension of devitalized tubercle bacilli. Dixon's tubercle extract, or fluid of Dixon, is an extract of bacilli dissolved in normal saline solution. Dixon's suspension of dead bacilli is a saline suspension of killed bacilli which have been subjected to prolonged treatment with alcohol and ether. Spengler's Perlsucht is prepared from bovine tubercle bacilli in the same way as Koch's old tuberculin. It is but slightly toxic for human beings.

When injected into the tissues of a healthy (nontuberculous) person no reaction follows; but in the presence of tuberculosis, wherever situated, both a local and general febrile reaction is observed. The general symptoms are fever and chills; locally it affects the skin, which becomes red and swollen. A better serum was introduced by Koch in 1897, and efforts in the same direction were made by Klebs in Germany and Hunter in England, the earlier product having been found to contain substances very toxic to man. On its first appearance Koch's lymph, as it was called, was hailed as a specific and widely used by unskilled observers in unsuitable cases and in excessive doses. The results were disappointing and the remedy fell into disrepute. With the production of purer serums, the acquirement of experience, and the use of smaller doses, treatment has been more successful and tuberculin is now recognized as a valuable therapeutic aid. Tuberculin is reliable as a diagnostic agent both in the human subject and in cattle, and is largely used to guard against the consumption of infected milk and meat.

For diagnostic purposes tuberculin may be employed in several ways. The cutaneous test of Von Pirquet (q.v.) consists in scarifying the skin as in vaccination and dropping undiluted tuberculin upon the raw surface. A reaction may be expected in about 48 hours. According to the technique of Calmette and Wolff-Eisner (the ophthalmo-reaction) tuberculin is dropped into the canthus of the eye. Moro's inunction test is performed by rubbing a 50 per cent lanolin ointment into the skin of the abdomen or chest. Consult Bandelier and Roepke, *Tuberculin in Diagnosis and Treatment* (New York, 1913), and Cochrane and Sprawson, *Guide to the Use of Tuberculin* (ib., 1915). See TUBERCULOSIS.

TUBER'CULO'SIS (Neo-Lat., from Lat. *tuberculum*, little swelling, pimple, tubercle, diminutive of *tuber*, swelling, tumor, knob on plants), or CONSUMPTION. An infectious disease, caused by the Bacillus tuberculosis, characterized by the formation, in the tissues, of nodular bodies, called tubercles, and manifested symptomatically by fever, cough, dyspnœa, and progressive loss of strength. The disease is widespread and causes about one-seventh of the deaths throughout the world. Its clinical features were recognized many centuries ago, and Hippocrates and Galen described them very accurately; but it was not until the growth of anatomical study in the seventeenth and eighteenth centuries that the characteristic lesions (tubercles) were recognized and associated with the disease. Important additions to the pathological knowledge of tuberculosis were made in the nineteenth century. Virchow's work in cellular pathology and finally Koch's brilliant discovery of the causative bacillus in 1882 settled all doubts as to the genesis and pathology of the disease, and since then nothing essential has been added to our knowledge concerning it.

Consumption prevails in all latitudes. Towards the poles and in very high altitudes the mortality is somewhat lower. No race is exempt, but negroes and Indians, and other races to whom the disease is comparatively new, are especially susceptible. In rare instances the disease is congenital, derived from the mother; there has been found no proof of paternal transmission either in man or animals. Hereditary predisposition has been thought to play an important rôle in determining the disease in individuals. Children of tuberculous parents are believed to be more liable than others to contract consumption. A predisposition to tuberculosis is acquired under conditions that seriously lower vital resistance. Among those are overcrowding, deficient ventilation, poor food, prolonged and exhausting disease, pregnancy and lactation, and unhealthful occupations, such as glass blowing, coal mining, street sweeping, exposure to cold and damp, and the excessive use of alcohol. The pulmonary complications following measles and whooping cough in children are often forerunners of a tuberculous deposit in the lungs.

The direct medium of contagion is the sputum of the tuberculous patient. The number of bacilli thrown off in this manner is enormous. The sputum becomes dry and desiccated, the bacilli are distributed by the dust and obtain entrance to the body again through the respiratory tract. The flesh or milk of tuberculous cattle is capable of transmitting the disease both to man and to other animals. Many cases of intestinal and mesenteric tuberculosis in children are attributable to this source. Finally, infection can be brought about by direct inoculation.

When the tubercle bacilli have once definitely invaded the lungs the disease may be fatal in three or four months, or from 10 to 15 years may elapse between infection and death. During this time it may be quiescent for months or a year or more. Two types are usually recognized. The rapid form (galloping consumption) begins after a cold or exposure, with rapidly rising temperature, pain in the side, difficult breathing, rust-colored sputum and consolidation of one or more lobes of a lung: in other words, like an attack of pneumonia. Instead, however, of improving at the end of the tenth day, the symptoms become graver, the fever continues high, the lung is rapidly softened and destroyed, and the patient rapidly succumbs. The second type, sometimes called chronic ulcerative tuberculosis, comes on more slowly and runs a longer course and includes the majority of cases of pulmonary tuberculosis. The disease begins with a slight but annoying and unproductive cough, a slight afternoon temperature, loss of appetite, and gradually increasing weakness. As the trouble progresses, the cough becomes severe and constant, with yellow or whitish expectoration, containing usually multitudes of bacilli, and sometimes tinged with blood. Fever is higher in the afternoon and evening and the temperature rarely drops to normal. Night sweats, pains in the chest, steadily progressing weakness, dyspnœa, and wasting are now present. Occasionally quantities of blood are brought up (hæmoptysis) during a paroxysm of coughing. It is bright red, frothy, and due to the ulceration of an artery of some size. The course is not always fatal; the disease may be arrested at any stage, and partial or complete healing take place, leaving scars or cavities in the lung. Improvement may be only temporary and the process start up again under favorable conditions. In fatal cases the last stage is marked by an exhausting diarrhœa, and swelling of the lower extremities. Death may take place suddenly from hemorrhage or gradually from exhaustion and profound toxæmia. Examination of the chest shows a deficient expansion of the ribs, rapid heart action, exaggerated voice sounds, irregular and high-pitched respiration, and different varieties of râles, depending on the stage of the morbid process. Diagnosis of the disease depends on these symptoms and physical signs, and on finding tubercle bacilli in the sputum. The X-ray photograph is a reliable means of distinguishing lesions in the lungs, peribronchial glands, and bones. Tuberculin (q.v.) is even more widely applicable in diagnosis, but the reaction is apt to occur in patients with healed lesions as well as in those with active processes.

The prevention of tuberculosis is one of the most difficult problems with which the sanitarian has to grapple, the disease being so widely disseminated, and so insidious in its approaches. Efforts in this direction are mainly directed to destroying tuberculous cattle, segregation of tuberculous individuals, and destruction of their sputum. Municipal ordinances against spitting in public places have been passed in many cities. Tuberculous persons should always use for their sputum special receptacles, which should be thoroughly disinfected and burned. Boards of health in the larger cities require physicians to report cases in private life and see that precautions against contagion are observed.

Individuals predisposed to consumption should lead an exceptionally careful life in an equable climate and out of doors. Particular attention should be given to keeping the upper respiratory passages in a healthy condition and guarding against colds. Tuberculosis is a curable disease in its earlier stages. Spontaneous cure is an everyday phenomenon, and a large proportion of individuals dying of other diseases are found on autopsy to possess healed tuberculous lesions in the lungs.

There is no successful specific treatment. Koch's tuberculin and its various modifications and the different antitoxins and antitubercle serums are being used, but have to be administered with great circumspection. The treatment of consumption is in most cases best carried out in well-regulated sanatoria, where the patient's life and habits are under expert surveillance. The main objects in view are to place the sufferer in an environment favorable for the attainment of the best possible nutrition, to relieve the cough, sweats, and other wearing symptoms, and to give medicines that tend to check the progress of the disease. Fresh air is an essential consideration, whether treatment is carried on in sanatoria or at home. In general, a dry, germ-free, bracing atmosphere, with an equable temperature and plenty of sunlight, where the patient can live out of doors, should be selected. There is no advantage in sending patients with inevitably fatal lesions away from home. The patient should sleep out of doors, even in stormy weather, if sheltered. Exercise should stop short of fatigue. The mental condition of the patient is of the utmost importance, and cheerful surroundings and occupation should be chosen where possible. Thus sanatoria for the tuberculous have been established on the seashore, in the desert, and in the mountains, often supported by private charity, a municipality, or State, by unions of workingmen or by employers, in which the treatment consists in living in the open air, with exercise and nourishing food, with or without tuberculin, under medical supervision. Similar sanatoria have been opened for tuberculous children, and a special treatment developed in Switzerland has been accepted in Europe and the United States. It is given in sanatoria, situated in sheltered localities in great altitudes, and consists in exposing the whole body of the tuberculous child in the open, even in snow at a temperature below freezing point, to the rays of the sun for a period ranging from a few minutes to an hour. Astonishingly good results have been reported.

Of drugs, the creosote group, cod-liver oil, and the calcium salts are valuable. Cod-liver oil improves the nutrition, acting better in children than in adults, and better in glandular and bone tuberculosis than in pulmonary. The emulsified fats or cream are good substitutes when cod-liver oil cannot be taken. Iron, arsenic, strychnine, and similar tonics are given according to indications. Fever is combated by rest, fresh air, and small doses of quinine; severe cough by opiates; night sweats by belladonna, strychnine, and the mineral acids; hemorrhage by complete rest, large doses of morphine, and suprarenal extract, with ice over the point of bleeding when it can be located. Vomiting, headache, indigestion, diarrhœa, etc., must be managed as in other diseases.

In 1906 Behring (q.v.) announced that after extracting certain substances from the tubercle bacilli with salt water and then with alcohol and ether, he powdered the bacilli and injected them subcutaneously with success. Practically the same method has been pursued by Von Ruck, of Asheville, N. C., since 1897.

Attempts to treat the disease locally by means of inhalation of antiseptic vapors, and ozonized air, and later by the X ray and concentrated sunlight, have had a small measure of success.

Surgical treatment of tuberculosis of the lungs consists in producing temporary collapse of the affected lung by nitrogen displacement, the lung being flattened against the mediastinum and a pneumothorax established. If such temporary collapse is impossible on account of the adherence of the two layers of the pleura, permanent solidification of the lung is effected by resection. Success has been reported of such surgical treatment of tuberculosis of the lungs in those cases in which (1) the disease is progressive, despite a two or three months' trial of sanatorium and tuberculin treatment, (2) the disease is complicated by marked secondary infection of tuberculous cavities, (3) severe and repeated spitting of blood occurs.

Tuberculosis attacks, primarily or secondarily, the lymph glands, bones, joints, intestines, peritoneum, brain, kidneys, bladder, spleen, liver, pleuræ, lungs, pericardium, heart, generative organs, eye, and skin. Its manifestations in these situations are described in the articles on ADENITIS; BLADDER; BRIGHT'S DISEASE; LUPUS; MENINGITIS; PERICARDITIS; PERITONITIS; PLEURISY; PYELITIS; SCROFULA; ETC.

Pathology and Bacteriology. Tuberculosis is invariably due to the presence in the body and to the action upon the body tissues of a specific microörganism known as the tubercle bacillus.

The organism is a thin bacillus from three to four micromillimeters long, i.e., about one-half the diameter of a red blood cell. It is often slightly curved and there is a marked tendency of the bacilli to hang together, two often lying in the shape of a letter V. The bacillus grows on ordinary culture media at body temperature, but the growth is extremely slow. Thus, cultures on blood serum or on nutrient agar rarely show any signs of growth earlier than two weeks, when thin grayish dry scales begin to appear on the surface of the medium. Cultures grow best in the dark; in fact, the bacillus is killed by exposure for a few hours to the direct rays of the sun. From a pure culture successive cultures may be made indefinitely. Such cultures show a gradual loss of virulence, but no changes in morphology. See Plate of DISEASE GERMS.

The bacillus stains with difficulty with the aniline dyes, but when once stained retains the dye with great tenacity. This process consists in treating a suspected specimen with a strong solution of a red dye known as fuchsin, to which carbolic acid has been added to increase its penetrating powers. After staining, the specimen is washed in dilute acid, which extracts the stain from all other bacteria. The tubercle bacilli retain the red stain in spite of the action of the acid and may thus be differentiated. Three types of tubercle bacilli are recognizable by their individual characters, the human, bovine, and avian types. The human type, although so named, is not the only one found in man; it is the organism present in the majority of cases, but in some cases of the human disease the bacilli are of the bovine type. The human bacillus produces a fatal tuberculosis in guinea pigs, chimpanzees, and monkeys, but only slight in cattle, goats, and pigs. The bovine tubercle bacillus produces a fatal tuberculosis in cattle, rabbits, guinea pigs, chimpanzees, monkeys, goats, and pigs. Fowls are very susceptible to the avian bacillus, but among the mammals only the rabbit and the mouse are affected, while in the other experimental mammals the bacillus never produces tuberculosis. The differentiation of the three types of bacilli is rather difficult and the differences are not permanent and stable.

The changes which the tubercle bacillus causes in the body tissues are various. Thus it may stimulate the passage of serum and white blood cells from the blood vessels into the tissues, causing an exudative inflammation; or it may stimulate the production of new connective tissue, causing what is known as a productive inflammation; or its effects may be more severe and lead to death of tissue or necrotic inflammation. Any one of these effects may be produced separately, or, as is commonly the case, they are combined. The most distinctive feature of the action of the tubercle bacillus in the body is the production of tubercles or tubercle tissue. This tubercle tissue may occur either as the nodular tubercle or as diffuse tubercle tissue. In the production of the tubercle the bacilli, according to the extensive researches of Baumgarten, first cause a proliferation of the connective tissue elements with the production of epithelioid and giant cells. Following this is an inflammatory reaction with the exudation of serum and white blood cells. The tubercle, which is now fully developed, may next undergo degenerative changes consisting of either caseation or sclerosis. Caseation begins in the centre of the growth and consists in a degeneration of the cells and their reduction to a homogeneous, structureless mass. Coincident with the caseation or following it is a sclerosis by which the tubercle is converted into a firm, hard substance composed of connective tissue rich in fibres.

Small tuberculous nodules are called miliary tubercles. Seen with the naked eye the nodular tubercle is a small white, gray, or yellowish body, the smallest not visible without a microscope. Microscopically these tubercles show around their edges proliferated connective tissue and endothelial cells, with often some giant cells, while the centre is composed of tissue undergoing caseation or coagulation necrosis. Tubercle bacilli may be few or numerous.

Diffuse tubercle tissue usually results from a rather extensive local infection resulting in many small foci near together. From these tubercles start to grow, and these coalescing form considerable areas of tubercle tissue. In addition to the formation of tubercles the bacilli or the presence of the tubercle tissue may set up secondary inflammatory processes.

Suppuration in connection with tuberculous inflammation frequently occurs. In the so-called cold abscess, however, the fluid is not, properly speaking, pus, but the products of breaking down of the tubercles. True suppuration in tuberculous conditions is due to what is known as mixed infection, i.e., the presence of pyogenic cocci as well as tubercle bacilli.

Acute general miliary tuberculosis is characterized by a rapid development of tubercles, usually of small size, in many parts of the body at about the same time. The number of tubercles is frequently very large. One of the explanations offered for such sudden general diffusion of tubercles is that the infection is secondary to tubercles located in the walls of some of the small blood vessels or lymphatics.

Pulmonary tuberculosis, tuberculosis of the lungs, lung consumption, or most commonly called simply consumption, is a form of tuberculous infection in which the only or the most prominent lesions are in the lungs. The bacilli usually gain entrance by being taken into the lungs with the inspired air. Less commonly infection of the lung may occur through bacteria brought to them by means of the blood or lymph channels from tubercular foci in other parts of the body. Several factors must be considered as determining the character of the inflammation which the tubercle bacillus may induce in the lungs. Among these may be mentioned the number of bacilli introduced, their virulence, the manner in which they enter the lungs, whether in respiration or by means of the blood or lymph, the susceptibility of the individual, etc. As a result of variation in these factors we find a variation in the character of the inflammation set up. Thus there may result an exudative inflammation in which the air spaces of the lung and the smaller bronchi are filled with serum, leucocytes, fibrin, and cast-off epithelium. Such reaction is quite similar to that induced by the pneumococcus in pneumonia. On the other hand, instead of an exudative inflammation, the tubercle bacillus may bring about the production of new tissue, i.e., a productive inflammation. This new tissue is composed of small round cells and epithelioid cells, such as have been described above as tubercle tissue.

While it is common for these different lung-tissue reactions to tuberculous infection to be associated, the predominance of one or another allows us to differentiate several quite distinct types of tuberculosis of the lungs.

Acute Miliary Tuberculosis of the Lungs. This occurs usually as a part of a general miliary tuberculosis, although it may be difficult to find lesions in other organs. The tubercles are found in both lungs, lying in the lung tissue proper, in the walls of the vessels and bronchi, or in the connective-tissue septa. These tubercles may go on to suppuration. They may coalesce to form larger tubercles. On the other hand, instead of breaking down, the tissue is sometimes converted into masses with or without calcified centres. These are known as healed tubercles, and may or may not contain tubercle bacilli.

Tuberculous Broncho-Pneumonia. In this form of tuberculous infection of the lungs, the tuberculous areas occur in the walls of the smaller bronchi and in the contiguous lung tissue. In its early stages the inflammation is mostly catarrhal, there being a more or less extensive exudate into the affected bronchi. As more and more bronchi are affected, there is frequently a coalescence of adjacent areas, with the formation of quite large masses of consolidation. These breaking down form cavities.

The term "phthisis" is sometimes applied to this form and to diffuse exudative tuberculous inflammation of the lungs, which may be either acute or chronic. In the acute form extensive areas of lung tissues may be involved, become consolidated, and, undergoing necrosis, result in the formation of large cavities. In the chronic form there is a slower involvement of the lung tissues, and there is apt to be more fibrous tissue, especially in the walls of cavities. This fibrous tissue lining often contains enormous numbers of tubercle bacilli, which are cast off in the sputum. It also furnishes a lodging place for pyogenic cocci, which cause suppuration of the membrane, and it is not at all improbable that these pyogenic cocci are very largely concerned in the formation of the cavities themselves. This secondary infection is also largely responsible for the bronchitis and yellow or greenish expectoration which so usually accompanies phthisis. Blood vessels stretch across these cavities or lie exposed in their walls, to be broken either by an extension of the disease itself or from a strain too sudden for their weakened walls. In this way may be caused the hemorrhages so frequently associated with phthisis.

The most frequent site of tubercles in the adult lung is the apex, although the initial lesion may occur in any part of the organ. In children the bronchial lymph nodes are usually first affected. Healed tubercles of the apex are found in a large proportion of autopsies.

Tuberculosis of Serous Membranes. Tuberculous pleurisy may be secondary to pulmonary disease, or may occur independently of any lesion in the lung proper. Tuberculous peritonitis may be primary, but is more frequently associated with tuberculous disease of some adjacent organs. In some cases minute tubercles are scattered over a part or all of the peritoneum and are usually accompanied by a serous or serofibrinous exudate. Tuberculous pericarditis may be primary or secondary, acute or chronic. In the acute miliary form the membrane is studded with tubercles and there is usually some serofibrinous exudate. In chronic cases the membrane is thickened, adherent, and usually shows several cheesy tubercular masses. The bronchial and mediastinal lymph nodes are regularly involved.

Tuberculosis occurs in bones, periosteum, and joints. Abscesses are sometimes formed, and the adjacent joints are frequently involved. The spongy parts of the bone are more susceptible than the hard parts. The vertebræ, carpal and tarsal bones are most commonly affected. The chronic, purulent periostitis of poorly nourished children is frequently tuberculous. For description of the lesion in tuberculous arthritis, see Synovitis.

Genitourinary System. Tuberculosis of the kidney may be primary or secondary. There may be small nodules in the kidney proper, or in the pelvis; or there may be quite large areas of tubercular tissue with necrosis. These may occur in only one kidney or in both kidneys. With much destruction of kidney tissue, cavities or cysts are formed, in some cases the kidney being almost wholly replaced by cysts of various size. There is apt to be thickening of the pelvis and tubercle tissue in its walls. Tuberculosis of the ureter and bladder is almost always secondary, especially to disease of the kidney pelvis. Small tubercles or patches of tubercle tissue are present in the ureter or bladder walls. Tuberculosis of the testes and epididymis occurs as a primary lesion or, more frequently, secondary to lesions elsewhere. In tuberculosis of the Fallopian tubes, the tubes are enlarged, their walls thickened, and the lumen usually filled with cheesy matter. Both tubes are frequently involved. Adhesions and the formation of abscesses are common results.

Liver. Miliary tubercles of the liver are quite common as a part of a general miliary tuberculosis. Sometimes the tubercles are among the liver cells, in other cases they develop in the walls of the smaller bile vessels, forming abscesses. Large tuberculous patches having a diameter of an inch or more are sometimes found. In connection with the tuberculous process there may be a marked increase in the connective tissue of the liver, constituting what is known as a tuberculous cirrhosis.

Lips, Mouth, etc. In tuberculosis of the lips, which is a rare disease, there develops on the lip an extremely sensitive ulcer. This ulcer has much the appearance of an epithelioma or a chancre. Tuberculous laryngitis is most frequently secondary to tuberculosis of the lungs. Miliary tubercles form in the submucosa and are accompanied by a catarrhal inflammation of the mucous membrane. With necrosis of the tubercles, ulcers are formed. These ulcers often run together, involve adjacent parts, and determine extensive destruction of tissue. Tuberculosis of the tongue is marked by the appearance of small nodules on the upper surface or edge of the organ. These open on the surface and become ulcers. It is a rare condition except when associated with tuberculosis of other parts. Tuberculosis also occurs in the palate, tonsils, pharynx, œsophagus, and stomach. The lesions are similar to those described in other mucous membranes, i.e., the formation of nodules, a catarrhal inflammation, and necrosis with the formation of ulcers.

Intestines. In tuberculosis of the intestines there is involvement of Peyer's patches and of the solitary lymph nodules as well as ulcers of the mucous membrane between the patches. As a primary lesion it is extremely rare in adults, much less rare in children, where there is apt to be involvement of the mesenteric glands or a tubercular peritonitis. In the secondary form of the disease in adults the lungs are the usual seat of the primary lesion. The ulcers occur chiefly in the colon, cæcum, and ileum. They may be very extensive, affecting the greater portion of the mucous membrane of both large and small intestines. The ulcers are irregular in shape, rough in outline, their long axes transverse to the lumen of the gut. They usually involve not only the mucous membrane, but also the submucosa and muscular coats. They rarely perforate. With healing of the ulcers, extensive scar tissues may form, so contracting the bowel as to cause stenosis. Not uncommonly tubercles are present on the peritoneum adjacent to the intestinal ulcers. Tuberculosis of the rectum is quite frequently associated with fistula, the fistula being of the nature of a tuberculous ulcer.

Tuberculous lesions may occur in the brain as part of a general process. In such cases it affects the meninges, causing meningitis, usually associated with an increase in the fluid within the ventricles (acute hydrocephalus). In chronic tuberculosis of the brain the lesion is a meningoencephalitis, the tubercles affecting both meninges and brain tissue proper. The lesion is usually localized and there are in most cases several nodules, usually attached to the pia mater and extending from the surface into the brain. The nodules may interfere with cerebral circulation, causing softening, or may incite an acute meningitis. The pia is apt to be thickened and adherent to the brain surface. Instead of several nodules there may be one large solitary tubercle. Lesions similar to those described for the brain may occur in the cord either with or without brain lesions. See the articles Bacteria; Disease, Germ Theory of.

In the early part of the twentieth century an active fight was waged in the United States against this scourge. According to the National Association for the Study and Prevention of Tuberculosis, there was spent in 1915 over $22,000,000 for antituberculosis work in the United States; over 100,000 people were employed in the campaign against this disease; there were 800 open-air schools, fresh-air classes, and special institutions for tuberculous and anæmic children; 450 tuberculosis dispensaries and clinics which treated annually over 100,000 cases; 600 sanatoria, hospitals, and day camps, having a total bed capacity of over 35,000; 1500 antituberculosis associations and committees, including 50 State organizations. The death rate from pulmonary tuberculosis in the registration area for 1913 was 127.7 per 100,000 population.

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TUBERCULOSIS, in Animals. This disease in the lower animals is now recognized as caused by three types of the *Bacillus tuberculosis* distinct from the human type, viz., the bovine and avian types and the type occurring in cold-blooded animals. Horses, sheep, goats, and dogs are rarely affected; poultry and parrots frequently; cattle and hogs most commonly. The annual loss in the United States due to tuberculosis in farm animals was estimated by the Secretary of Agriculture in 1915 as no less than $25,000,000 and was surpassed only by the loss from hog cholera and from Texas fever and the cattle tick. In order to emphasize the importance of this affection from the public-health standpoint it should be pointed out that the bovine type when ingested in milk by children may produce tuberculosis—forms other than phthisis. As a result of investigations and statistical studies, Park and Krumwiede, well-known authorities, have found that from 6 to 10 per cent of all deaths of young children due to tuberculosis are caused by the bovine type. The cases of tuberculous adenitis and abdominal tuberculosis of children were indeed found to be more often caused by the bovine than by the human type. It is known that the avian type may be transmitted to other farm stock, particularly the pig. Both the bovine and human types may cause the disease in parrots, the bovine being the more virulent. Other birds of domestication possess considerable resistance to infection with tubercle bacilli of the mammalian types.

European and American statistics from tuberculin tests and from meat inspection indicate that from 5 to 50 per cent of the cattle are affected. Tubercles may be found locally or generally distributed in the respiratory, alimentary, and lymphatic structures and in the bones of the animal examined. For the detection of incipient cases of tuberculosis in cattle tuberculin is usually employed. This substance contains what is called the toxin produced during the growth of the bacillus, but does not contain the living organism. When subcutaneously injected into healthy cattle tuberculin produces no reaction, but in more than 99 per cent of affected cattle an elevation of from 1.5 to 3° or more of body temperature and a slight swelling at the point of injection are looked for. Animals which show these symptoms are tuberculous and should be separated from the rest of the herd. The tuberculin may also be applied in several other ways, which are known as the ophthalmic, dermal, and intradermal tuberculin tests.

Treatment of the disease in the domestic animals is not seriously considered by any authorities at the present time. In suppressing the disease animals reacting to the tuberculin test are slaughtered. In the early stages of the disease much of the meat may be saved for food. Several other methods of procedure have been suggested for use with valuable breeding animals that are affected. Of these, the method of Bang has been the most widely employed, especially in Denmark, Sweden, and Norway. This consists in the destruction of animals in which the disease can be detected without the aid of the tuberculin test, and the separation and isolation of other animals that react to the test. Since calves reared from affected animals are usually born healthy, they may be removed at birth from the isolated cows and be brought up by hand or upon healthy cows. The milk of reacting cows may be used if it is first boiled or pasteurized. Preventive measures are cleanliness, airy quarters, pure water and food, and free range upon good, well-managed pastures.

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TUBEROSE (*Polianthes tuberosa*).

TUBEROSE, tūb′rōs′ *or* tū′bẽr-ōs′ (from Lat. *tuberosa*, fem. sing. of *tuberosus*, tuberous, from *tuber*, swelling, tumor, knob on plants; associated by popular etymology with Eng. *tube* *rose*), *Polianthes tuberosa.* The only species of its genus, which belongs to the family Amaryllidaceæ. The plant, which is a native of Mexico, has a tall stem with long leaves at the base and shorter ones towards the top of the several-flowered spike of very fragrant white blossoms. The plant grows well in mild climates, but it bears the open air in northern countries only during the summer. Near Grasse, in southern France, the tuberose is largely grown as a source of perfume. The popularity of a double-flowered form has suffered from its too extensive use in funeral designs, etc. In outdoor culture in mild climates the plants are not disturbed during the winter, but in northern climates the tuberous rootstocks are taken up and stored in a dry, frost-proof place. In the colder regions where the bulbs fail to mature completely they are imported usually towards the end of the year, planted in pots, and given bottom heat. When danger of frost has passed they are set in light, moist, and rich soil and kept well supplied with water.

TUBES. See Pipe.

TUBES OF FORCE. See Electricity.

TUBES OF INDUCTION, TUBES OF MAGNETIC FORCE. See Magnetism.

TUBEUF, tụ'bēf', Karl, Baron von (1862–). A German botanist, born at Amorbach. He studied at the University of Munich, where he taught from 1885, becoming professor of the anatomy, physiology, and pathology of plants in 1902. He was chosen a member of the Imperial Board of Health in 1899, and was appointed director of its biological section in 1901. He founded and edited several scientific journals, and published: *Samen, Früchte, und Keimlinge der in Deutschland heimischen oder eingeführten forstlichen Kulturpflanzen* (1891); *Pflanzenkrankheiten, durch kryptogame Parasiten verursacht* (1895; Eng. trans., *Diseases of Plants Induced by Cryptogamic Parasites,* 1897); *Die Nadelhölzer* (1897); *Studien über die Brandkrankheiten des Getreides* (1901); *Wandtafeln über Bauholzzerstörer* (1910).

TUBE WEAVER. Any one of the tube-building spiders of the families Drassidæ and Clubionidæ. They are, as a rule, dark-colored spiders, which spin no web, but wander about at night in search of prey and hide during the daytime. They make silken tubes in which they hide in the winter and while molting or laying eggs. See Spider.

TUBIÈRES, tụ'byâr', Anne Claude Philippe de. See Caylus, Count de.

TUBIGÓN, tōō'bē-gōn'. A town of Bohol, Philippines, situated about 28 miles northeast of Tagbilaran (Map: Philippine Islands, E 6). Pop., 1903, 15,168.

TÜBINGEN, tụ'bĭng-*en*. A town of Württemberg, Germany, crowning a hill on the upper Neckar, 18 miles south-southwest of Stuttgart, on the edge of the Black Forest (Map: Germany, C 4). It owes its celebrity chiefly to the ancient university. (See Tübingen, University of.) The antique houses and narrow streets of the old part of the town give it a quaint appearance. St. George's Church (*Stiftskirche*) contains a beautiful choir, and the Roman Catholic church is a superb edifice. The town hall is an interesting timber-built structure, recently restored. The poet Uhland, who was born in Tübingen, is commemorated by a fine statue. On a hill above the city stands the interesting Renaissance castle, Hohentübingen, completed in 1540. It affords a magnificent view. The university library and observatory are here. North of Tübingen is the Cistercian monastery of Bebenhausen (1185), an exceptionally fine example of Gothic architecture. It has beautiful cloisters and an art collection. The Protestant seminary, dating from 1536, became noted under Baur, who founded the Tübingen school of theology. (See Tübingen School.) There is also a Roman Catholic seminary. Both of these institutions possess good libraries. The town has a surgical clinic, a woman's hospital, and a hospital for the insane. The manufacture of surgical and scientific instruments, book printing, and the cultivation of hops and the vine are the leading industries. Pop., 1900, 15,338; 1910, 16,809, nearly all Protestants.

Consult K. Fink, *Tübingen* (Zurich, 1891), and Klüpfel and Eifert, *Geschichte und Beschreibung der Stadt und Universität Tübingen* (2 vols., Tübingen, 1894).

TÜBINGEN, University of. A German university, founded in 1477 by Count Eberhard im Bart of Württemberg. It was organized with the usual four faculties. Reuchlin, Melanchthon, and Heinrich Bebel taught there at various times. Under Dukes Ulrich and Christopher, the university took an active part in the Reformation. What made the university famous in its early days and since is the Protestant seminary established in 1536 for the education of evangelical ministers, which is directly under the Minister of Public Worship and Education. It thus became the leading theological university in Germany. The institution maintained a steady growth until the establishment of the Karlsschule by Duke Charles Eugene, when it suffered a temporary decline. King Frederick took away from the university in 1811 most of its rights and privileges. In 1817 the Catholic university founded at Ellwangen in 1812 was united with Tübingen, and a Roman Catholic theological faculty was added; at the same time the faculty of political science was created, and in 1863 was added the natural science faculty. In the nineteenth century the institution experienced a vigorous growth, due chiefly to the great theologians, such as Baur, the head of the Tübingen school of criticism, Strauss, and many others. Since 1832 the whole university has practically been rebuilt. The university consists of the following faculties: (1) Evangelical-theological; (2) Catholic-theological; (3) law; (4) medicine; (5) natural science; (6) philosophy; (7) political science. It includes numerous seminaries, laboratories, and clinics. The library now contains over 550,000 volumes and nearly 4213 manuscripts. The attendance in 1913 was 2329. Consult references under Tübingen.

TÜBINGEN SCHOOL. A term applied to a modern theological movement which had its origin in the teachings of Ferdinand Christian Baur (q.v.), of the University of Tübingen. Though he was unwilling to admit that he was a disciple of Hegel, Baur's distinctive and guiding principles were those of the Hegelian philosophy. It was his aim to reconstruct the history of early Christianity so that it would be seen to be in harmony with the laws which everywhere govern historical evolution. He began his critical work with the Apostolic age. In 1831 he published his essay *Die Christuspartei in der korinthischen Gemeinde, der Gegensatz des paulinischen und petrinischen Christentums* *in der ältesten Kirche, der Apostel Petrus in Rom.* In this were foreshadowed all his later critical results. His position was that the early Apostolic church was split into two hostile factions, Pauline (Gentile) and Petrine (Jewish), between which there was a bitter conflict. Although an element of Jewish Christianity (the Ebionites) remained unreconciled to the last, the Pauline party (mainly after Paul's death) made concessions, and thus brought about a reconciliation which resulted in the establishment of the Old Catholic church. These views were elaborated and fully stated in the works: *Ueber die sogenannten Pastoralbriefe* (1835, the same year in which Strauss's *Leben Jesu* appeared); *Paulus der Apostle Jesu Christi, sein Leben und Wirken, seine Briefe und seine Lehre* (1845; 2d ed., 1866); *Die kanonischen Evangelien* (1847); and *Das Christentum und die christliche Kirche der drei ersten Jahrhunderte* (1853). Baur's position led him necessarily into a thorough reconstruction of the history of the origin of the New Testament literature. His theory demanded that the New Testament books in which the evidences of the conflict were most patent, or in which either of the two conflicting views was positively stated, should be considered earliest in date. Therefore, Paul's four genuine letters (Rom., 1 and 2 Cor., and Gal.) of the Pauline wing, and the Apocalypse by John, with the early Hebrew form of the Gospel of Matthew, of the Petrine or Jewish wing, were named as the earliest productions of the Apostolic church. The other books were dated according to the exigencies of the general theory—Mark, as altogether neutral, being set down as the latest of the Synoptics, and with our Greek Matthew, Luke, Acts, John, and the Pastoral Epistles placed very late, altogether outside of the Apostolic age. In Acts, in particular, the desire to reconcile the two parties, even at the expense of genuine Paulinism, was said to be quite manifest. This criticism, based on the supposed tendency (*Tendenz*) of the New Testament documents and now known as "tendency criticism" (*Tendenzkritik*), was thoroughly under the control of the Hegelian conception of the history, in accordance with which it moves from unity through conflict into reunity, embodying, as Hegel formulated it, the principles of "thesis, antithesis, and synthesis." Baur's theory, practically unaltered, was advocated with great brilliancy by E. Zeller in the organ of the school, the *Theologische Jahrbücher* (from 1842 on), and in *Die Apostelgeschichte nach ihrem Inhalt und Ursprung* (1856), by A. Schwegler in *Das nachapostolische Zeitalter* (1846), and by Karl Planck and Karl Köstlin in various publications. Others of the school differed from the master in important details, though fully accepting his main principle. Of these Volkmar in Switzerland, Hilgenfeld and Holsten in Germany, Scholten in Holland, S. Davidson in England, may be cited as representatives. David F. Strauss (1808–1874) and Bruno Bauer (1809–1882) are often spoken of as representatives of the Tübingen School. This, however, is not strictly correct as far as Strauss is concerned. He was influenced both by Hegel and by Baur in his early years, but that was before Baur himself had fully formulated his views, though Bruno Bauer wrote under the full influence of the movement. In fact, the position of Strauss and of Bruno Bauer was, if anything, hostile to that of the Tübingen School, carrying the naturalistic principles of the school out to their logical results, and saying, in the case of Strauss, that on this basis there was no outcome short of a mythical history, and, in the case of Bauer, that on this basis there was no issue but an unhistorical literature.

The most important defection in the ranks of Baur's disciples was that of Albrecht Ritschl (q.v.), who in the second edition of his *Die Entstehung der altkatholischen Kirche* (1857) asserted that it was a mistake to explain the origin of Old Catholic Christianity as a union of early Jewish, or Petrine, Christianity and modified Paulinism. His trenchant criticism and that of others gradually showed the baselessness of many of Baur's positions. At his death in 1858 it was already evident that the dates he assigned to New Testament books could no longer be defended. The whole theory, in fact, as originally formulated by Baur, has no advocates at the present time, although some scholars, while independent of any formal adhesion to Baur's theory, are at one with the great Tübingen professor on important points.

Bibliography. Besides the writings noted above, consult I. A. Dorner, *History of Protestant Theology* (Eng. trans., 2 vols., Edinburgh, 1871); R. M. Mackay, *The Tübingen School and its Adherents* (London, 1863); E. Reuss, *Geschichte der heiligen Schriften des Neuen Testaments* (2d ed., Brunswick, 1890); Otto Pfleiderer, *Development of Theology in Germany since Kant* (London, 1890); A. C. Zenos, *The Elements of the Higher Criticism* (New York, 1895); H. S. Nash, *The History of the Higher Criticism of the New Testament* (ib., 1906); E. C. Moore, *An Outline of the History of Christian Thought since Kant* (1912).

TU'BULAR BRIDGE. See BRIDGE.

TU'BULIFLO'RÆ. One of the great divisions of Compositæ (q.v.), including the forms in which the corolla of all the perfect flowers is tubular. When ray flowers are present they are either pistillate or neutral. The genera *Eupatorium*, *Aster*, and *Helianthus* (sunflower) are good representatives of this series. The contrasting division is Liguliforæ, in which all the flowers are ligulate, as in *Taraxacum* (dandelion).

TUBURÁN, tōō'bōō-rän'. A town of Cebú, Philippines, situated on the west coast, 32 miles north of Cebú (Map: Philippine Islands, D 5). Pop., 1903, 19,158.

TUBUS. A Nigritian people. See TIBBUS.

TUCANO, tōō-kä'nō. A tribe residing upon the Uaupés River, on the Brazil-Colombia border, and supposed to be remotely of Arawakan stock (q.v.). They take their name from the toucan bird. They tattoo three lines upon each cheek, build circular houses of poles covered with palm leaves, are good canoemen, and are noted for their skill with the blowgun.

TUCK, FRIAR. The jolly chaplain and boon companion of Robin Hood and his men.

TUCKAHOE, tŭk'ȧ-hō'. A village in Westchester Co., N. Y., 4 miles from New York City's northern limits, on the New York Central Railroad (Map: New York, B 2). It is the seat of Concordia College. There are lime and marble-dust works, marble quarries, and manufactories of rubber goods, wire, furniture, grease guns, and cabinets. Pop., 1910, 2722; 1915 (State census), 2753.

TUCK'ER, ABRAHAM (1705–74). An English moralist, born in London. He studied at Merton

College, Oxford, and was entered at the Inner Temple, but never called to the bar. Inheriting a fortune from his father, he purchased in 1727 Betchworth Castle and estate, near Dorking, in Surrey. During his last years he was blind. Tucker's great work is entitled *The Light of Nature Pursued* (1768–78). It was begun in 1756, and occupied most of his remaining years. It extended to seven volumes, four of which were published in the author's lifetime, under the pseudonym of Edward Search. It consists of disquisitions on metaphysics, theology, and morals, of remarkable originality, simplicity of humor, and ingenuity of illustration. Consult his *Works*, edited with a *Life* by H. Mildmay (London, 1805; several times reprinted).

TUCKER, Alfred Robert (1849–1914). An English bishop, born at Windermere and educated at Christ Church, Oxford. Ordained in 1882, he was curate at Clifton and Durham and was also identified with the work of the Church Missionary Society. He performed notably fruitful service as Bishop of Eastern Equatorial Africa, or Mombasa, from 1890 to 1899, and then, the territory having been divided, as Bishop of Uganda. In 1911 he visited England to raise funds for new buildings for the mission, and while there was offered the canonry of Durham, which he accepted and held until his death. He published *Eighteen Years in Uganda and East Africa* (2 vols., 1908; new ed., 1911).

TUCKER, Benjamin R(icketson) (1854–). An American anarchist, born near New Bedford, Mass. He studied at the Massachusetts Institute of Technology, worked in a printing office, and in 1878 joined the editorial staff of a Boston newspaper. Through the influence of Josiah Warren (q.v.) and others he became interested in radical thought, and made a special study of Proudhon's philosophy. In 1877 he founded a quarterly, *The Radical Review*, which failed of support, but the journal *Liberty*, established in 1881, came to be known as one of the leading anarchist publications. Tucker adopted Proudhon's views on economy, but in other respects his philosophy closely follows Herbert Spencer. Besides translations from Bakunin, Proudhon, and others his writings include *Instead of a Book* (1893; 2d ed., 1897), which, in part, gives his philosophy of anarchism, and *State Socialism and Anarchism* (1899). See Anarchism, *History of the Theory*.

TUCKER, George (1775–1861). An American author, born in Bermuda. He was graduated at William and Mary College in 1797, studied law, practiced at Lynchburg, was a member of the Virginia Legislature, and of Congress (1819–25), gained distinction as a debater and constitutional lawyer, and was (1825–45) professor of moral philosophy and political economy in the University of Virginia. He was a frequent contributor to political periodicals, and published, among many other works, *Letters on the Conspiracy of Slaves in Virginia* (1800); *The Valley of the Shenandoah* (1824), a novel; *A Voyage to the Moon*, a satirical romance (1827); *Principles of Rent, Wages, and Profits* (1837); *Life of Thomas Jefferson* (1837); *The Theory of Money and Banks Investigated* (1839); *Progress of the United States in Population and Wealth in Fifty Years* (1843); *History of the United States* (to 1841, 1856–58); *Banks or No Banks* (1857); *Essays, Moral and Philosophical* (1860). His *History of the United States* is still a work of some importance.

TUCKER, Henry St. George (1780–1848). An American lawyer, son of St. George Tucker (1752–1828) and father of John Randolph Tucker (1823–97) (qq.v.). Born at Williamsburg, Va., and educated at William and Mary College, he practiced law at Winchester, Va., served as a volunteer officer in the War of 1812, and was a member of Congress in 1815–19, and a member of the Virginia Senate in 1819–23. Tucker served also as Chancellor of the State (1824–31), as president-judge of the Virginia Court of Appeals (1831–41), and as professor of law at the University of Virginia (1841–45). He published: *Commentaries on the Law of Virginia* (2 vols., 1836–37); *Lectures on Constitutional Law* (1843); *Lectures on Natural Law and Government* (1844).

TUCKER, Henry St. George (1853–). An American lawyer and legal scholar, born at Winchester, Va. He was educated at Washington and Lee University (A.M., 1875; LL.B., 1876), and after admission to the bar practiced at Staunton. He served as a Representative in Congress from 1889 to 1897. He then succeeded his father, John Randolph Tucker (1823–97) (q.v.), as professor of constitutional and international law at Washington and Lee, being also dean of the law school from 1899 to 1902, and from 1903 to 1905 was a dean at Columbian (now George Washington) University. In 1904–05 he was president of the American Bar Association and in 1905–07 president of the Jamestown Tercentenary Exposition. In 1914 he was Commissioner General to the Panama-Pacific Exposition. He was editor of *Tucker on the Constitution* (1899), and wrote *Limitations on the Treaty-Making Power* (1915).

TUCKER, John Randolph (1812–83). An American naval officer, born at Alexandria, Va. He entered the United States navy as a midshipman in 1826, and in 1855 reached the rank of commodore. In 1861 Tucker resigned his commission and entered the Confederate service. In command of the *Patrick Henry*, he took part in the Hampton Roads engagements, receiving command of the wooden fleet after the *Monitor-Merrimac* battle, and assisted in the repulse of the Union squadron at Drury's Bluff. He was promoted captain in May, 1863, commanded at Charleston and at Drury's Bluff, and after the evacuation of Richmond was with Lee's retreating army. In 1866 Tucker became commander of the Peruvian navy, with the rank of rear admiral, and he commanded the naval forces of Peru and Chile in their war with Spain. Subsequently he explored parts of the upper Amazon region. He died at Petersburg, Va.

TUCKER, John Randolph (1823–97). An American congressman, son of Henry St. George Tucker (1780–1848) (q.v.). He was born at Winchester, Va., and graduated in law at the University of Virginia in 1844. He was elected Attorney-General of Virginia in 1857 and was reëlected in 1859 and 1863. At Washington and Lee University he served as professor of equity and public law in 1870–74, and thereafter until 1887 was a member of the national House of Representatives, where he won distinction as an orator. Subsequently he returned to occupy a chair at Washington and Lee, where later he also became dean of the law school. At his death, Henry St. George Tucker (q.v.), his son, succeeded to his professorship. In 1892–93 he was president of the American Bar Association.

TUCKER, Josiah (1712–99). An English economist and divine, the son of a Welsh farmer. He was educated at St. John's College, graduating in 1736. He became rector of St. Stephen's, Bristol (1749), and dean of Gloucester (1758). In 1755 he received from Oxford the degree of D.D. Tucker was a careful writer on political economy and religious subjects. He also published pamphlets advocating separation in the beginning of the contest between the English government and its American colonies. As an economist he has some claims as a forerunner of Adam Smith (q.v.), but Tucker elaborated no system. Consult W. E. Clark, *Josiah Tucker* (New York, 1903).

TUCKER, Nathaniel Beverley (1784–1851). An American lawyer, son of St. George Tucker. He was born at Williamsburg, Va., was educated at William and Mary College, studied law and practiced in Virginia until 1815, when he removed to Missouri. He was a judge in the Circuit Court until 1830 and professor of law in William and Mary College (1834–51). He published works on *Pleading* and *Constitutional Law* and several practical essays. His best literary effort was his novel, *The Partisan Leader, a Tale of the Future* (1836). He also wrote *Balcombe* (1836).

TUCKER, St. George (1752–1828). An American lawyer, born in Bermuda. He came early to Virginia and was educated at William and Mary College, after which he was called to the bar. During the Revolutionary War he commanded a regiment at Yorktown, where he was badly wounded. In 1778 he married the mother of the afterward celebrated John Randolph of Roanoke. He served in the Legislature, but won his chief distinction as professor of law in William and Mary, and as presiding judge of the Virginia Court of Appeals and of the United States District Court. He is still remembered for a scholarly edition of Blackstone's *Commentaries* (1803) and for a single lyric beginning "Days of my youth." He also published a *Dissertation on Slavery* (1796) and other politicolegal works, and composed poems and dramas. See also Tucker, Henry St. George (1780–1848); Tucker, Nathaniel Beverley (1784–1851).

TUCKER, Samuel (1747–1833). An American naval officer, born at Marblehead, Mass. The son of a shipmaster, he ran off to sea when 11 years old, became commander of a merchantman in 1768, and in January, 1776, was commissioned captain in the American navy. In command of the *Franklin* and later of the *Hancock*, he captured over 30 British vessels, and in March, 1777, was transferred to the frigate *Boston*, which (February, 1778) carried John Adams as Commissioner to France. After taking many prizes, he was forced to surrender at Charleston (May, 1780), but was soon exchanged, and as captain of the *Thorn* secured many prizes. In July, 1781, Tucker was again captured and released on parole. In 1813 he captured a British vessel which threatened the coast near his home (Bremen, Me.). He served in the Massachusetts Legislature (1814–18), helped frame the Maine constitution (1819), and sat in the Maine Legislature (1820–21). Consult Sheppard, *Life of Commodore Samuel Tucker* (Boston, 1868).

TUCKER, William Jewett (1839–). An American clergyman and educator. He was born at Griswold, Conn., and graduated from Dartmouth in 1861 and from Andover Theological Seminary in 1866. He was pastor of the Madison Square Presbyterian Church, New York, in 1875–79; a professor at Andover in 1879–93, and thenceforth president of Dartmouth College until his retirement in 1909. He lectured at Lowell Institute, at Union Seminary, and at Yale Divinity School, was university preacher at Harvard, and founded Andover (now South End) House, a social settlement in Boston. His writings include: *From Liberty to Unity* (1892); *The Making and the Unmaking of the Preacher* (1898); *Public-Mindedness* (1910); *Personal Power* (1910); *The Function of the Church in Modern Society* (1911).

TUCKERMAN, Bayard (1855–). An American author. He was born in New York, graduated from Harvard in 1878, and completed his studies in Paris. From 1898 to 1907 he lectured on English literature at Princeton. His writings include: *A History of English Prose Fiction* (1882); *Life of General La Fayette* (1889); *Diary of Philip Hone* (1889); *Peter Stuyvesant* (1893); *William Jay and the Constitutional Movement for the Abolition of Slavery* (1893); *Life of Philip Schuyler, 1733–1804* (1903).

TUCKERMAN, Edward (1817–86). An American botanist, born in Boston. He studied at Union College, at Harvard University, and abroad. He was professor of botany at Amherst from 1858 till his death. Although devoted to a variety of botanical studies, he made a specialty of lichenology, publishing: *A Synopsis of the Lichens of New England* (1848); *Genera Lichenum: An Arrangement of the North American Lichens* (1872); *A Synopsis of the North American Lichens* (part i, 1882; part ii, edited, with an appendix, by Henry Willey, 1888). His *Lichenes Americæ Septentrionales Exsiccati* (1847–55) contains 150 species. Consult the *Memoir* by W. G. Farlow (Washington, 1887).

TUCKERMAN, Henry Theodore (1813–71). An American critic and essayist, born in Boston and prominent in the literary life of New York City after 1845. The more important of his numerous publications were: *The Italian Sketchbook* (1835), *Isabel, or Sicily: A Pilgrimage* (1839), each the outcome of a residence in Italy; two volumes of verse, *Poems* (1851) and *A Sheaf of Verse* (1864); *Artist Life, or Sketches of American Painters* (1847); *Characteristics of Literature* (1849; 2d series, 1851); *America and her Commentators* (1864); *Thoughts on the Poets* (1864); and *Book of the Artists* (1867), a study of the progress of art in America.

TUCKERMAN, Joseph (1778–1840). An American clergyman and philanthropist. He was born in Boston; graduated at Harvard College (1798); studied theology, and became a Unitarian pastor in Chelsea in 1801. In 1826 he was appointed by the American Unitarian Association minister at large, devoting himself to mission work in Boston. He is best known as one of the founders of the first sailors' aid societies in the country (1812), and as one of the pioneers in the scientific direction of philanthropy. He wrote much in behalf of his projects. Consult the collection of his writings under the title *On the Elevation of the Poor* (Boston, 1874) and his *Life* by W. E. Channing (ib., 1841), and by Miss May Carpenter (London, 1849).

TUCO-TUCO, to͞o'kô-to͞o'kô. A small burrowing ratlike rodent, a spiny rat of the genus

Ctenomys, several species of which are so called in imitation of their loud, treble call.

TUCSON, tōō-sŏn′. The largest city of Arizona, and the county seat of Pima County, 135 miles southeast of Phœnix, on the Santa Cruz River, and on the El Paso and Southwestern, and the Southern Pacific railroads (Map: Arizona, D 5). It is the seat of the University of Arizona, opened in 1891, and of St. Joseph's Academy, and contains a Carnegie library, the Desert Botanical Laboratory of the Carnegie Institution, and the United States Magnetic Observatory. Cattle raising and copper mining are the leading industries of the surrounding district, which also has considerable agricultural resources. The industrial establishments of the city are for the most part connected with the mining industry, and there are some manufactories of wagons, harness, saddlery, and flour. Tucson adopted the city-manager form of government in 1915. Pop., 1900, 7531; 1910, 13,193; 1915 (U. S. est.), 16,177.

Tucson was first permanently settled as a presidio by the Spaniards about 1776, though there had been previously a small Indian village, or rancheria (abandoned in 1763), under the control of the Spanish authorities. It lies within the territory obtained for the United States by the Gadsden Purchase of 1853. It was the capital of Arizona Territory from 1867 to 1877. Consult Bancroft, *History of New Mexico and Arizona* (San Francisco, 1880).

TUCUMÁN, tōō′kōō-măn′. The smallest and most densely populated province of Argentina (Map: Argentina, F 3). Area, 8928 square miles. The eastern portion is rolling, but the western portion becomes quite mountainous. The mountains, offshoots of the Andes, afford extensive forests in the valleys, and some mines of gold, silver, and copper, but these are not extensively worked. Sugar and rum are the chief products, but cereals, rice, tobacco, grapes, and fruits are raised. The soil generally is fertile, but in some portions use must be made of irrigation. The population, largely mestizo, numbered in 1912 about 325,000. Capital, Tucumán (q.v.). Tucumán was originally a portion of the dominions of the Incas. After the conquest the Gobernación of Tucumán included many of the surrounding provinces, and was first subject to the Audiencia of Charcas, and after 1776 to the Viceroyalty of La Plata.

TUCUMÁN, or **SAN MIGUEL DE TUCUMÁN**. A city of Argentina, capital of the Province of Tucumán, 690 miles northwest of Buenos Aires, on a plateau to the right of the river Tala or Sali (Map: Argentina, F 3). It is a regularly built city, but with narrow streets. The cathedral is modern. It has a university, opened in 1914. It is rapidly becoming a commercial centre of importance. The city was founded in 1565. Here, July 9, 1816, the representatives of the Plata Provinces signed the declaration of independence from Spain. Pop., 1913 (est.), 79,000.

TUCUMÁ (tōō′kōō-mä′) **PALM**. See ASTROCARYUM.

TUCUMCARI, tōō′kŭm-kär-ĭ. A city and the county seat of Quay Co., N. Mex., about 350 miles southwest of Denver, Colo., on the Chicago, Rock Island, and Pacific and the El Paso and Southwestern railroads (Map: New Mexico, F 3). It contains a United States Land Office, a government experiment farm, and a city library. Tucumcari is a distribution point for coal and coke, has cattle-raising and wheat and corn growing interests, and manufactures sisal. Pop., 1910, 2526.

TUCUNA, tōō-kōō′nȧ. A wild tribe of the upper Amazon. See TICUNA.

TUCUXI, tōō-kōō′ʜē (South American name). A South American dolphin (*Sotalia guianensis*), very abundant in the Bay of Rio Janeiro, where the natives regard it as able to bring ashore drowned persons, and have other fanciful ideas in regard to it. The genus *Sotalia* is represented by other species in various parts of the world, some of which live wholly in fresh water. Consult F. E. Beddard, *Book of Whales* (London, 1900).

TUDELA, tōō-ᴅā′lȧ. A town of the Province of Navarra, Spain, on the Ebro, here crossed by a bridge of 19 arches. It is 48 miles by rail from Saragossa (Map: Spain, E 1). Most of its important public buildings are modern, but it is especially famous for the Romanesque Colegiata (formerly the cathedral), which is regarded as one of the finest churches in Europe. The chief industries are the sawing of lumber, the manufacture of cloth, silk goods, earthenware, and the production of oil and wine. The best wine of Navarra, resembling Burgundy, is produced in this vicinity. Pop., 1900, 8996; 1910, 9072. Tudela fell into the hands of the Moors in the eighth century, but it was retaken by Alfonso I of Aragon in 1114. In 1808 the Spanish forces under Castaños were here defeated by the French under Lannes.

TUDELA, BENJAMIN OF. A mediæval traveler. See BENJAMIN OF TUDELA.

TU′DOR. The family name of the dynasty which occupied the throne of England from 1485 to 1603. Its founder was Owen Tudor, an obscure Welsh squire, who had five children by Catharine, daughter of Charles VI of France. Their son Edmund was made Earl of Richmond by Henry VI, kinsman of Edmund's wife, Margaret. It is through Margaret that the family derived its defective title to the crown. She was the heiress of the Beauforts, children of John of Gaunt by Catharine Swynford, who had been legitimized for every purpose except royal succession. Her son, Henry, Earl of Richmond, became head of the Lancastrian house in 1471, and in 1485, at Bosworth Field, defeated Richard III, who fell in the battle. Henry was able to secure the support of the Yorkist nobles upon promising to marry Elizabeth, the heiress of the York family. Parliament confirmed Henry's claim to reign of his own right, though the lawful heir was either his wife, Elizabeth, or, if females could not succeed her cousin Edward, the Earl of Warwick. The Tudor monarchs were Henry VII (1485–1509), Henry VIII (1509–47), Edward VI (1547–53), Mary (1553–58), and Elizabeth (1558–1603). The Stuart dynasty, which came to the throne in 1603, derived its title through Margaret, daughter of Henry VII, who married James IV of Scotland. During the Tudor period the crown was nearly absolute. The dynasty was strong and purposeful, and while the rights and functions of Parliament were not formally denied, its deliberations were controlled by royal influence over elections or by vigorous and tactful management. The local institutions kept their full vigor and the English people retained their training in self-government. When danger of feudal anarchy and foreign invasion had passed, and public safety no longer required a strong executive, Tudor absolutism speedily disappeared under the weak and tactless Stuart dynasty. For details and bibliographies, see the names of the separate sovereigns. See also Roses, Wars of the; York, House of. Consult A. D. Innes, *England under the Tudors* (New York, 1905); C. R. Lumsden, *The Dawn of Modern England* (ib., 1910).

TUDOR, Mary (1496–1533). Queen of France. She was the daughter of Henry VII of England. In 1514 she was married to Louis XII of France and after his death, in 1515, to Charles Brandon, Duke of Suffolk. Her only child, a daughter, Frances, became the wife of Henry Grey, Marquis of Dorset, and was the mother of Lady Jane Grey.

TUDOR, William (1779–1830). An American merchant and author, born in Boston. He was founder (1815) and first editor of the *North American Review*. He graduated at Harvard (1796), engaged in business, visited Europe, and on his return took part in founding the Anthology Club and contributed frequently to its magazine, *The Monthly Anthology* (1803–11). Out of this club grew the Boston Athenæum (1807), of which Tudor was also a founder. He originated the movement for erecting Bunker Hill Monument. In commerce he gained distinction as a pioneer in the ice trade with tropical countries. He was a member of the Massachusetts Legislature for some years, appointed United States Consul at Lima, Peru (1823), and chargé d'affaires in Brazil (1827). He published *Letters on the Eastern States* (1820), *Miscellanies* (1821), *Life of James Otis of Massachusetts* (1823), and an anonymous political allegory, *Gebel Teir* (1829), written in Rio de Janeiro, where he died.

TUDOR STYLE. In English architecture, a rather indefinite term applied to the late Perpendicular (q.v.) and the transition from that to Elizabethan (q.v.), especially as developed in nonecclesiastic buildings—schools, colleges, and mansions.

TU'FA (It., calcareous rock). A name applied to any cryptocrystalline variety of calcium carbonate which has a cellular structure, especially those varieties deposited from springs or streams. A similar material emanating from volcanoes is known as *volcanic tufa*.

TUFF (Fr. *tuf, tuffe*, from It. *tufo, tufa*, from Lat. *tophus, tofus*, tufa, calcareous rock). Fragmental volcanic material when compacted together to form a rock. The material which by cementation of some kind has formed the tuff may be finely comminuted (volcanic ash or sand), or of larger fragments (lapilli and bombs). A large proportion of tuffs have been laid down under water, or have been carried by water in the form of volcanic mud. In rare cases they are composed largely of crystals. Unconsolidated volcanic fragments are called agglomerate, or agglomerate tuff. If large and angular fragments predominate in a tuff it is often called a volcanic breccia. Such breccias are produced when a stream of lava flows over and picks up an agglomerate, and also when certain viscous lavas flow down a slope. In the latter case the lava stream consolidates in a shell about a central molten mass, the shell constantly fracturing and as quickly healing its fractures by outflow and consolidation of molten material.

TUFTS, Cotton (1734–1815). An American physician, born in Medford, Mass. He graduated at Harvard in 1749, studied medicine, and settled at Weymouth, Mass., and in 1765 wrote the instructions regarding the Stamp Act to the representatives of Weymouth in the Provincial Legislature. He was one of the founders of the Massachusetts Medical Society and of the American Academy of Arts and Sciences, being president of the former in 1787–95, and was a member of the State convention which ratified the Federal Constitution.

TUFTS, James Hayden (1862–). An American philosophical scholar, born at Monson, Mass. He graduated from Amherst College in 1884, and from Yale Divinity School in 1889, and later studied at Berlin and Freiburg (Ph.D., 1892). At the University of Chicago, with which he was connected after 1892, he became professor of philosophy in 1900, and head of the department in 1905, and he served also as dean of the Senior College (1899–1904 and 1907–08). In 1914 he was president of the American Philosophical Association. He translated Windelband's *History of Philosophy* (1893; 2d ed., 1910); contributed to Baldwin's *Dictionary of Philosophy and Psychology* (1901); edited the *School Review* in 1906–09; and wrote *James Tufts, a Memorial* (1902), and *Ethics* (1908), with John Dewey.

TUFTS COLLEGE. An institution for higher education founded at Medford, Mass., in 1852. The campus embraces about 80 acres, on which are 20 buildings used for education and dormitory purposes. The associated schools which include the School of Liberal Arts, Jackson College for Women, the Engineering School, the Bromfield-Pearson School, the Crane Theological School, and the Graduate School are located at Medford. The Tufts College Medical and Dental schools and the one-year medical course are in Boston. The college also has an interest in the biological laboratories at Harpswell, Me. The degrees conferred are Bachelor of Arts, Bachelor of Science, Bachelor of Sacred Theology, Master of Arts, Master of Science, Doctor of Medicine, and Doctor of Dental Medicine. The Bromfield-Pearson School is a preparatory institution for the Engineering School. Among the notable buildings on the campus is the Barnum Museum of Natural History, built and maintained by a fund given by Phineas T. Barnum. This museum has a large zoölogical collection, especially large in skeletons, and mounted skins of mammals, including the skeleton of the famous elephant "Jumbo." The Eaton Library, the gift of Mr. Andrew Carnegie, contains about 73,000 volumes and 64,000 pamphlets. The total enrollment in all departments of the college in 1915–16 was 1541 students. Of these 509 were in the Dental School, 383 in the Medical School, 216 in the College of Liberal Arts, 192 in the Engineering School, and 96 in the Jackson College for Women. The faculty numbered 249, of whom 86 were of professorial grade. The total capital of the college in all departments including buildings at the end of the collegiate year 1915 was $3,250,000. The buildings and grounds were valued at about $1,500,000. The president in 1916 was Herman C. Bumpus, Ph.D.

TU FU, to͞o fo͞o (712–770). A noted poet of China. He was born in 712 in Siangyangfu (q.v.) in the present Province of Hupeh, according to one authority, or in Tuling in Shensi, according to another. Through failure in literary examinations he lost official chances, but became a professional poet, and produced three descriptive poems (742–755) which gained him favor from the reigning Emperor, and a position at court, where he became popular. This Emperor fled from rebels, but Tu Fu fell into their hands, escaping in 757. He was recalled by the new Emperor, and became a censor. Having defended an official who had incurred the displeasure of the Emperor, he fell into disgrace, was banished, and given the position of a subprefect in a small town of Shensi. This he promptly resigned and retired to Sze-chuen. In 761 a post was provided for him in connection with the Board of Works. This he held for six years, when he resumed his wandering life. The edition of his poems published in 1059 contained 1405 compositions. He is the most quoted poet in China. See specimens in H. A. Giles, *History of Chinese Literature* (New York, 1901).

TUGENDBUND, tōō'gent-bụnt'. An association organized at Königsberg, Prussia, in February, 1808, for the purpose of furthering the physical and moral regeneration of the Prussian people in the period of national degradation following the disasters of the years 1806–07 and the dismemberment of the Prussian Kingdom by Napoleon I at Tilsit. Its secret purpose was the overthrow of the French domination. It was dissolved in December, 1809, after it had accomplished much good in its self-appointed task of bringing to life the spirit of Prussian patriotism.

TUGUEGARAO, tōō-gä'gȧ-rä'ō. The capital of the Province of Cagayán, Luzon, Philippines (Map: Philippine Islands, C 2). Cagayán is the most northern province of Luzon and is exceedingly mountainous. The climate is very severe in the winter, and not healthful in the summer, owing to the excessive humidity. The province is well watered and has a fertile soil; its area is 5052 square miles. Pop., 1903, 156,239. The capital is situated on the river Cagayán, in the southern part of the province. It has a town hall, courthouse, and a government building. Pop., 1903, 16,105.

TUI, tōō'ē. See Parson Bird.

TUILERIES, twēl'rē' (Fr., tile works). A former royal palace in Paris, situated on the right bank of the Seine, on ground originally occupied by tile yards. The site was acquired by Louise of Savoy, mother of Francis I, in 1527, and the erection of the palace was begun about 1565 by Catharine de' Medici, under the direction of Philibert de l'Orme (q.v.). The main structure of the original palace comprised a central pavilion crowned by a cupola, flanked by low wings, forming part of a plan for a grandiose palace of many courts. With the death of De l'Orme in 1570 this vast plan was abandoned, and the wings were completed by Jean Bullant. Henry IV caused the erection of the Pavillon de Flore on the south wing and began the construction of a long gallery connecting it with the Louvre (q.v.). Under Louis XIV the central pavilion was greatly enlarged, the wings increased in depth and height, and the Pavillon de Marsan on the north wing was erected. In spite of its imposing size, the palace possessed little artistic interest, owing to the inharmonious diversity of architectural form of its long façade. Before the Revolution it was intermittently a royal residence, though frequently the scene of splendid fêtes; in its theatre were given plays of Corneille, Molière, and Voltaire. On Oct. 6, 1789, Louis XVI and the royal family, brought by the Parisian mob from Versailles, took up their residence in the Tuileries. It was invaded by a mob on June 20, 1792, without great harm. On August 10, however, the organized sections of Paris stormed the Tuileries and after a bloody battle cut down the Swiss Guard, who, after defending its great stairway with devoted courage, were ordered by the King to lay down their arms. The royal family were forced to take refuge in the hall of the Assembly and thence were removed to the Temple. In 1793 the Convention began to hold sessions in the north wing, the Pavillon de Marsan being given up to committee rooms, administrative offices, etc. After the establishment of the Consulate the Tuileries became the residence of Napoleon, and, with changes in internal construction, it remained the residence of the rulers of France to the fall of the Second Empire (excepting 1848–52). During the War of the Commune in 1871 the palace was set on fire (May 24) at the orders, it is supposed, of the Communist leaders. In the night of May 24–25 heavy explosions of gunpowder completed the ruin of the main structure. The right wing, containing the Pavillon de Flore, escaped destruction. The Pavillon de Marsan was restored in 1875–78, and the Pavillon de Flore, with the adjacent Grande Galerie, was reconstructed about the same time on a modified design. The ruins of the main buildings were removed in 1883. The Garden of the Tuileries, covering about 75 acres, lies between the Place de la Concorde, the site of the palace, the Rue de Rivoli, and the Quai des Tuileries. It was laid out by Le Nôtre in the time of Louis XIV, but has undergone extensive changes, especially under the Second Empire. The garden contains notable examples of sculpture; it is a popular resort of Parisians, especially as a playground for children. See Paris.

TUISTO. See Mannus.

TUKARAM, tụ-kä'räm. See Marathi.

TUKE, Daniel Hack (1827–95). A celebrated English alienist, born at York. He studied medicine at St. Bartholomew's Hospital College, of London, and in 1852 became a member of the Royal College of Surgeons, of which he became a fellow in 1857. He was afterward visiting physician to the York retreat for the insane, and subsequently medical practitioner at Falmouth and London. He wrote many essays for scientific periodicals on the treatment of insanity, and was coeditor of the *Journal of Mental Sciences*, 1878–92. He wrote a prize essay on the *Progressive Changes which have taken place since the time of Pinel, in the Moral Management of the Insane* (1854); *Illustrations of the Influence of the Mind upon the Body, etc.* (1872; 2d ed., 2 vols., 1884); *Insanity in Ancient and Modern Life* (1878); *Chapters in the History of the Insane in the British Isles* (1882); and a *Dictionary of Psychological Medicine* (2 vols., 1892).

TUKE, Henry (1755–1814). A Quaker writer born at York, England. His father was William Tuke (q.v.), one of the founders of the first asylum for humane treatment of the insane. After his education in liberal studies he engaged in business with his father at York, and at the age of 25 he became a minister of the Society of Friends. His books were extensively read at home and some of them were translated into French, German, and Danish. The chief of them are: *The Faith of the People Called Quakers* (1801); *The Principles of Religion as Professed by the Society of Christians Usually called Quak-*

ers (1805); and *The Life of George Fox* (1813).—His son, SAMUEL TUKE (1784–1857), studied medicine and became widely known for his strenuous defense of the asylum at York, and for varied philanthropic work. Among his publications are *Descriptions of the Retreat* (1813), concerned with the establishment which his father and grandfather had founded, and constituting the earliest account of the humane treatment of the insane; and *Practical Hints on the Construction and Economy of Pauper Lunatic Asylums* (1815), which is also important in the history of the treatment of the insane.

TUKE, WILLIAM (1732–1822). An English philanthropist. He was born in York, was a Quaker in religion, and engaged in mercantile pursuits the greater part of his life, but found time for many works of benevolence. His greatest achievement was the opening of the York Retreat in 1796, the first institution in England where the insane were treated with kindness and humanity. In this undertaking he had the aid of his son Henry, Lindley Murray, and other Quakers. His descendants have been prominent in British philanthropy. Tuke's biography was written by his great-grandson (York, 1856).

TULA, to͞o'lȧ. A government of central Russia. Area, about 11,960 square miles (Map: Russia, E 4). It belongs to the central Russian plateau and has an undulating surface cut by deep river valleys. It is watered chiefly by the Oka and its tributaries and the Don. Tula belongs to the black soil belt of Russia. In the southwest are deposits of coal, and iron ore is found in all parts. Agriculture is the main occupation, but the household industries are also remarkably developed. Bee raising is another important industry. The chief manufactured products are small metal articles, samovars (teakettles), wagons, musical instruments, arms, etc. The trade in grain is extensive. Pop., 1897, 1,419,456; 1912, 1,829,200.

TULA. The capital of the Government of Tula in Russia, situated on the Upa, 121 miles south of Moscow (Map: Russia, E 4). It is an interesting and important town, with an old kremlin rising above the river, an extensive government arms factory and a museum. Tula has also a number of private arms factories, and extensive metal works, where the samovars (see SAMOVAR) for which Tula is famous are manufactured. Its favorable geographical position, together with its mines, have promoted the town's commercial development. Pop., 1911, 136,530.

TULA. A Mexican town of the State of Hidalgo, 45 miles by rail north of the city of Mexico, on the Tula (or Montezuma) River (Map: Mexico, J 7). The town, the ancient capital Tollan, is believed to have been founded by the Toltecs, and contains the ruins known as Montezuma's Palace, and others of interest attributed to those people. It is situated at an elevation of 6766 feet above the sea. The fortress-like church and cloister of San José date from 1553. There are some cotton manufacturing establishments. Pop., about 5000.

TULA. A town in the State of Tamaulipas, Mexico, 61 miles southwest of Victoria (Map: Mexico, J 6). It is an important commercial centre in a rich agricultural district producing chiefly ixtle. Pop., 1910, 6707.

TULALIP, to͞o-lä'lĭp (North American Indian, bay, inlet). A tribe of Salishan stock (q.v.) occupying a reservation of 36 square miles on Tulalip Bay, an eastern inlet of Puget Sound, Washington. They are a division of the Twana. See SALISHAN STOCK.

TULANE, tṳ-lān', PAUL (1801–87). An American philanthropist, born near Princeton, N. J. He received a common-school education and in early life removed to New Orleans, where he engaged in business and acquired great wealth. He retired in 1867, and returned to Princeton. He was the founder of Tulane University (q.v.).

TULANE UNIVERSITY OF LOUISIANA. An institution at New Orleans, La., organized on its present basis in 1884, when the State placed the existing University of Louisiana, chartered in 1845, under the perpetual care of the Board of Administrators of the Tulane Educational Fund. In 1882 Paul Tulane (q.v.) gave his property in that city for the higher education of the "white young persons in the city of New Orleans." His donations up to the time of his death amounted to $1,050,000. The university consists of the Graduate Department, the College of Arts and Sciences, the College of Technology, the H. Sophie Newcomb Memorial College for Women, the College of Law, College of Commerce and Business Administration, and the College of Medicine, consisting of schools of medicine (graduate and undergraduate), pharmacy, hygiene and tropical medicine, and dentistry. It confers the bachelor's degree in arts, science, education, and music, and the professional degrees in engineering, law, medicine, pharmacy, and dentistry. All the departments are situated in the city of New Orleans. The campus contains about 100 acres, including the athletic field. The total attendance in 1915 was 2708, the faculty numbered 301 and the library contained 69,500 volumes. The value of the grounds and buildings was estimated at $2,215,000, the total valuation of the university property being $2,664,000. The endowment was $5,310,914 and the gross income $371,664.

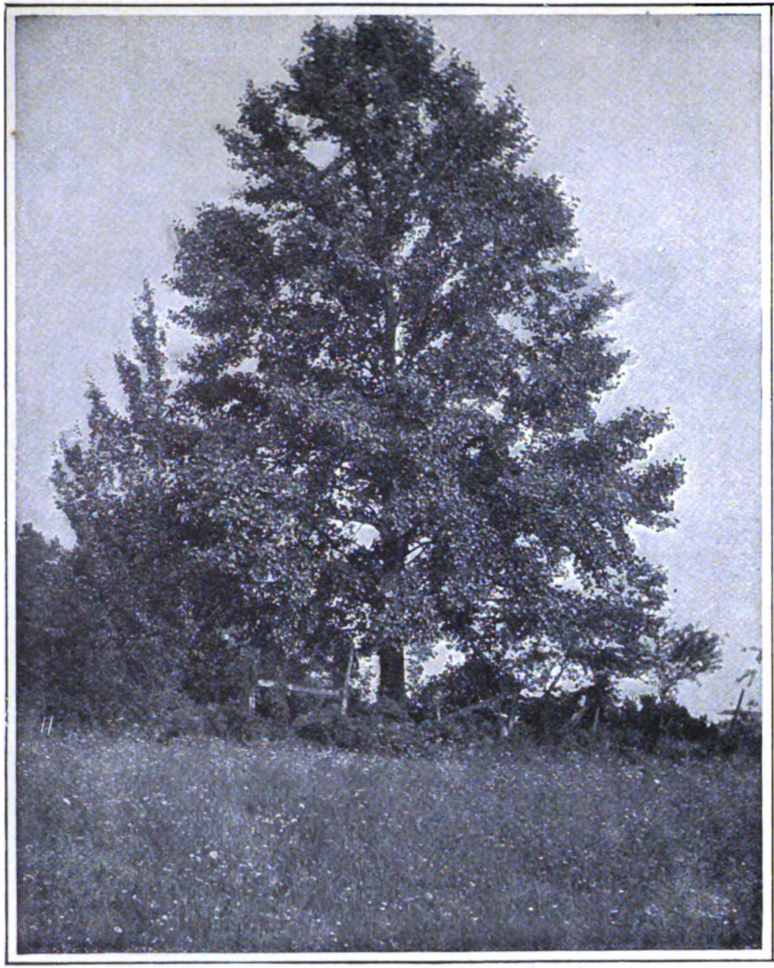
TULARE, to͞o-lar'ȧ. A city in Tulare Co., Cal., 45 miles southeast of Fresno, on the Southern Pacific and the Atchison, Topeka, and Santa Fe Coast Line railroads (Map: California, F 6). It carries on an important trade in fruits and cereals, dairying and fine cattle. There are three large creameries. Tulare has a public library. Pop., 1900, 2216; 1910, 2758.

TULASNE, tụ'län', LOUIS RENÉ (1815–85). A French botanist, born at Azay-le-Rideau (Indre-et-Loire). After studying law, he turned his attention to botany and made a specialty of parasite mushrooms, becoming the founder of modern mycology. From 1842 to 1872 he was at first "aide naturaliste," then professor at the Museum of Natural History in Paris. His most important publications include: *Histoire et monographie des champignons hypogés* (1851); *Selecta Fungorum Carpologia* (3 vols., 1861–65), with his brother Charles; and many monographs. Among several discoveries he made, that of polymorphism among fungi marked an epoch in the science.

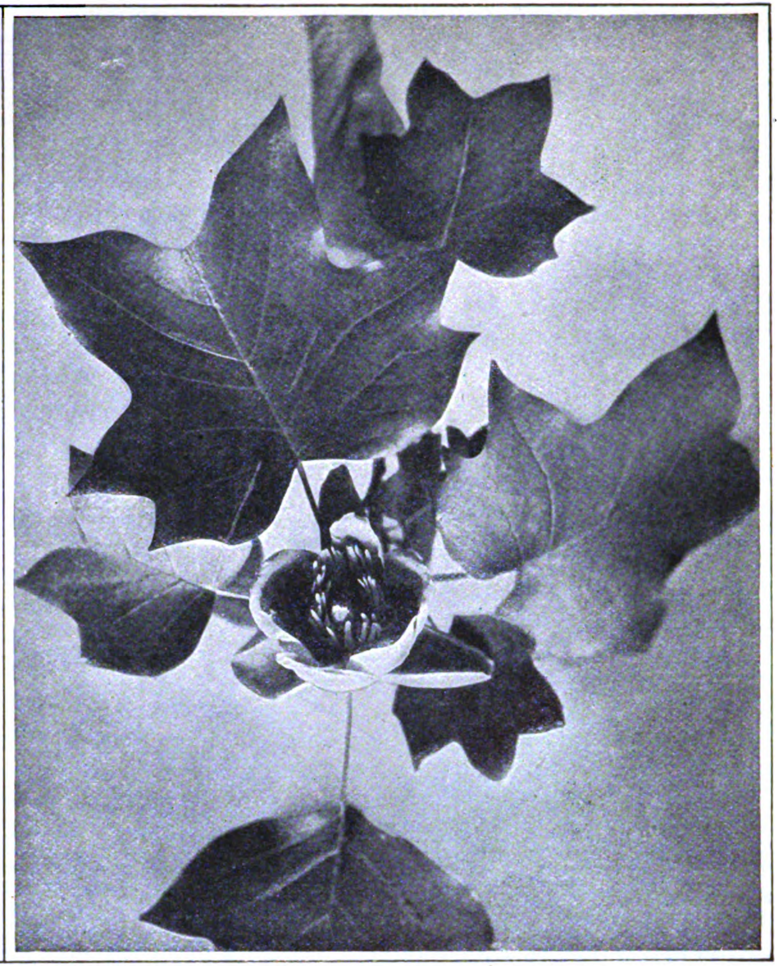
TULCEA, or **TULTCHA**, to͞ol'chȧ. A district town of the Dobrudja, Rumania, situated on an arm of the Danube, about 45 miles from the Black Sea (Map: Balkan Peninsula, G 2). It has a good harbor, with a large trade in fish, grain, and wool. Pop., 1900, 18,800.

TULIP (OF., Fr. *tulipe*, from *tulipan*, tulip, *tulipant*, *tulpant*, *toliban*, *tolopan*, turban, from Turk. *tulband*, *dulband*, from Pers. *dulband*, turban), *Tulipa*. A genus of showy hardy

TULIP TREE

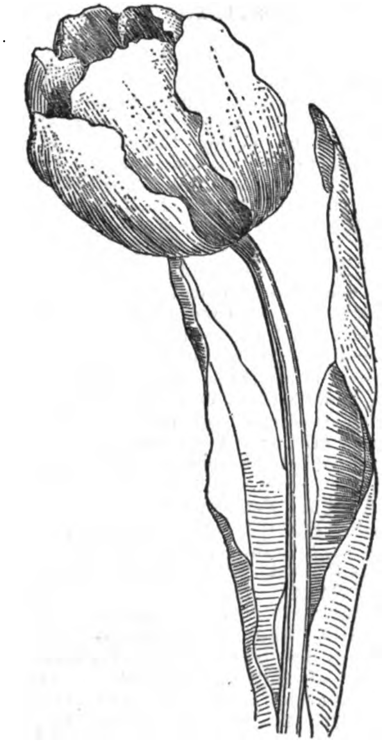


TULIP TREE (Liriodendron tulipifera)



FLOWERING BRANCH.

plants of the family Liliaceæ, easily recognized by its fleshy brown-skinned bulbs, broad or linear leaves, and generally erect and usually solitary-flowered scapes. About 45 species are described, mostly natives of the warmer parts of Asia and southern Europe. For centuries the tulip has been a popular ornamental plant for spring and early summer, and has recently been used by florists for winter flowering. The species from which most cultivated varieties have been derived, *Tulipa gesneriana*, is a native of Asia Minor and was brought from Constantinople to Germany by Conrad Gesner in 1559. Since then innumerable varieties have been originated, 1800 varieties being offered by Dutch growers, who are the leading producers of these bulbs. Several other species have given rise to cultivated varieties, but to a more limited extent. *Tulipa suaveolens*, a native of southeastern Europe, is the wild species from which the early red and orange Duc van Thol tulips have been obtained. They are inferior to the common garden tulip in beauty, but are prized for their fragrance and earliness. (See Colored Plate of LILIACEÆ.) *Tulipa præcox* is the generally cultivated form of *Tulipa oculus-solis*, a beautiful species from southern France, characterized by a large black spot with a yellow border at the base of each petal. *Tulipa greigi*, a native of Turkestan, is a fine species from which several cultivated forms have been developed. The natural species are rarely grown. Tulips are cultivated in gardens and need a rich, sandy loam. The bulbs or offsets are planted in mid-autumn and the flowers appear in spring. When the plants have blossomed and the leaves have begun to dry the bulbs are taken up, dried in a cool airy place, and stored in a dry place until replanted. For pot culture tulips are treated like hyacinths. Young plants are also obtained by sowing the seed in light sandy soil under a cold frame in late winter. Seedlings seldom flower before they are five years old and are rarely stable; i.e., after flowering one or more times they break or develop a new form of color, which remains stable not only with the individual bulb, but with its offsets.



TULIP (*Tulipa gesneriana*).

During the first half of the seventeenth century interest in the tulip rose to a speculative basis. Bulbs sold for fabulous prices, even 13,000 florins ($5200) being paid for a single specimen of Semper Augustus. Ownership in individual bulbs was divided into shares; bulbs were sold before their existence and by men who possessed none; and of some varieties far more were sold than existed. The craze was short-lived, but it financially ruined many. Consult J. Jacob, *Tulips* (London, 1912).

TULIP TREE (*Liriodendron tulipifera*). A beautiful North American tree of the family Magnoliaceæ, found from Massachusetts and Vermont to Wisconsin and south to Florida, Mississippi, and Arkansas, having a stem sometimes 100 to 140 feet high and 5 to 9 feet thick, with a grayish-brown cracked bark and many gnarled and brittle branches. The solitary terminal flowers resemble tulips. The bark has a bitter, aromatic taste, like other members of the Magnoliaceæ. The tulip tree is one of the most beautiful ornaments of pleasure grounds. In some parts of the Mississippi valley it forms considerable forests, seldom or never occurring alone, but in mixed woods. The heartwood is yellow, the sapwood white. The timber is easily wrought, takes a good polish, and is much used for house carpentry and other purposes where a light wood is desired. The timber is usually called poplar, tulipwood, or whitewood. Fossil leaves of ancestors of the tulip tree are found in abundance in the North American and Arctic Cretaceous rocks. These earliest representatives had leaves that were not so distinctly lobed and that resembled, in their entire margins, more nearly those of the very young individuals than those of the full-grown trees of the modern plant.

TULL, JETHRO (1674–1741). A British agriculturist. He was born at Basildon, Berkshire, and entered Oxford in 1691, but two years later took up the study of law at Gray's Inn. In 1699, shortly after becoming a barrister, he settled upon a farm at Howberry, where, having trouble in making his laborers carry out his advanced ideas, he endeavored to make implements which would do the work "more faithfully than such hands would do." The results of his experiments are set forth in his *Horse-Hoeing Husbandry, or an Essay on the Principles of Tilling and Vegetation* (1733; 2d ed., with addenda, 1743; 3d ed., 1751). French translations appeared in 1753 and 1757, and a new and somewhat altered edition was put forth by William Cobbett in 1822. This work, which is the first of its kind, exercised a profound influence on methods of soil management, and upon it Tull's fame chiefly rests. See TILLAGE.

TULLA, tụl′lȧ, JOHANN GOTTFRIED (1770–1828). A German engineer. He was educated in Heidelberg and Freiburg, and after filling various engineering appointments became chief engineer of the construction of water and road ways for the Grand Duchy of Baden in 1813. He founded the Engineer School of Baden, and subsequent to 1818 had much to do with the preparation of the plans for the deepening of the river Rhine. He wrote *Ueber die zweckmässigste Behandlung des Rheins* (1822) and *Ueber die Rektifikation des Rheins* (1825).

TULLAHOMA, tŭl'ȧ-hō'mȧ. A city in Coffee Co., Tenn., 69 miles southeast of Nashville, on the Nashville, Chattanooga, and St. Louis Railroad (Map: Tennessee, D 3). Noteworthy features are the buildings of the Fitzgerald and Clarke Preparatory School, city hall, Pythian Home, Chautauqua grounds, State Vocational School for Girls, Cumberland Springs, Pylant Springs, and Hurricane Springs. The chief manufactures are buggies and parts, golf sticks, tobacco products, and overalls. Pop., 1900, 2684; 1910, 3049.

TULLE, tụl. The capital of the Department of Corrèze, France, 106 miles by rail southwest of Clermont-Ferrand (Map: France, S., F 3). It is a picturesque town with quaint houses. The cathedral (fifteenth century), with a fine bell tower, and the abbot's house (fifteenth century), are noteworthy. A large government firearms factory is in the suburb of Souilhac. From Tulle first came the famous lace of that name. Pop., 1901, 17,412; 1911, 16,942.

TUL'LIBEE (North American Indian name). A well-marked and valuable whitefish (*Argyrosomus tullibee*) of the Great Lakes, Lake of the Woods, and northward. It is bluish with white sides showing silvery stripes.

TUL'LIUS, Servius. The sixth legendary king of Rome. He is said originally to have been a slave of Tanaquil, the wife of Tarquinius Priscus (see Tarquinius). The latter befriended him, and Tullius, after marrying the daughter of Tarquinius, practically became the ruling power in the state. This aroused the ire of the sons of Ancus Marcius, who were in line of succession, and they caused Tarquinius to be assassinated. Tanaquil, however, frustrated their plans by concealing the fact of her husband's death until Tullius had obtained a firm hold in the government. According to tradition the reign of Tullius was marked by important reforms, notably the promulgation of a new constitution and the formation of an alliance with the Latins. The new constitution, which aimed to give the plebeians political independence and to make property rather than birth the basis of political influence, was offensive to the patricians, who, under the leadership of Lucius, a son of Tarquinius Priscus, formed a conspiracy, which resulted in the assassination of Tullius. Tradition also adds that Tullia, the daughter of Tullius and wife of Lucius, as she was returning from the Senate, which, countenancing the atrocious murder of Tullius, had recognized the claims of Lucius to the throne, drove her chariot over her father's dead body, which still lay in the street, where he had been struck down by the assassins. See Comitia, 2; Plebeians; Rome, *Ancient Rome*, in the section entitled *History of Rome during the Earliest or Regal Period*, last paragraph.

TUL'LIVER, Maggie. The heroine of George Eliot's *Mill on the Floss*.

TUL'LOCH, John (1823–86). A Scottish scholar and educator. He was born at Dron, Perthshire, was educated at St. Andrews, and ordained at Dundee, in 1845, as a minister in the Church of Scotland, and became principal of St. Mary's College, in the University of St. Andrews. In 1859 he was appointed one of her Majesty's chaplains for Scotland. He was highly appreciated as a broad-minded, progressive theologian, was moderator of the General Assembly in 1878, was appointed dean of the chapel royal and dean of the Thistle in 1882, and died at Torquay. Among his works are: *Leaders of the Reformation* (1859; 3d ed., 1883); *Beginning Life* (1862); *Rational Theology and Christian Philosophy in England in the Seventeenth Century* (1872; 2d ed., 1874); *The Christian Doctrine of Sin* (1876); *Movements of Religious Thought in Britain during the Nineteenth Century* (1885). Consult Mrs. M. O. W. Oliphant, *Memoir of the Life of John Tulloch* (3d ed., London, 1889), and A. K. H. Boyd, *Twenty-five Years of St. Andrews* (2 vols., ib., 1892–93).

TULLUS HOSTILIUS. See Hostilius, Tullus.

TULPI'NUS. See Turpin.

TULSA, tŭl'sȧ. A city and the county seat of Tulsa Co., Okla., 120 miles northeast of Oklahoma City, on the Atchison, Topeka, and Santa Fe, the Midland Valley, the Missouri, Kansas, and Texas, the St. Louis and San Francisco, and the Tulsa and Sand Springs railroads (Map: Oklahoma, E 2). It is the seat of the Henry Kendall College (Presbyterian), and contains a fine high school, a Carnegie library, and well-kept parks and boulevards. In the vicinity are found natural gas, coal, and enormous quantities of crude oil, the city being the centre of a vast oil-producing region. Among the industries are manufactories of brick and tile, sewer pipe, glass, cottonseed oil, pumps, engines, tools and machinery, and sand, stone, and wood products; oil refining, coal mining, and wheat milling. Tulsa adopted the commission form of government in 1908. Pop., 1900, 1390; 1910, 18,182; 1915 (U. S. est.), 28,240.

TULTCHA. See Tulcea.

TULTCHIN, tōōl'chĕn. A town in the Government of Podolia, Russia, 100 miles east of Kamenets-Podolsk. Pop., 1910, 25,904.

TULU'NIDS. A Mohammedan dynasty in Egypt (868–905). The founder was Ahmed ibn Tulun. His father was a Turkish prisoner of war sent by the Governor of Transoxania as a present to al Ma'mun (813–833). Ahmed received a careful education and when, after Tulun's death, his mother married the powerful General Baik-beg, he was sent as Governor to Egypt (868). He soon made himself practically independent of the Bagdad caliphate. By his administrative ability he developed the resources of the country and the income of the government. He built mosques, garrisons, and hospitals. In 878 he conquered Syria, with the exception of Antioch, and was besieging Tarsus when he died in 884. His son Khumaraweihe (884–895) squandered the treasures left him by his father, but was able, through his victory at Ramle in 885, to recover Syria, which had been taken from him. He was assassinated in 895. His son Jeish (895–896) was deposed; another son, Harun (896–904), lost his life in a tumult while Egypt was attacked by the Caliph Muktafi's general, Mohammed ibn Suleiman. Ahmed's son Sheiban (904–905) was unable to resist the attack, and the Tulunid dynasty came to an end in 905. Consult August Müller, *Der Islam in Morgen- und Abendland* (Berlin, 1885), and Clement Huart, *Histoire des Arabes* (Paris, 1912).

TULUS, tōō'lōōz. One of the civilized or half-civilized Dravidian peoples of Hindustan.

They inhabit the coast region about Mangalore, and their language is closely related to ancient Kanarese (q.v.). Consult Brigel, *Grammar of the Tulu Language* (Mangalore, 1872).

TUMACO, tōō-mä′kō. A seaport of the Department of Cauca, Colombia, 150 miles southwest of Popayán (Map: Colombia, B 3). It has an extensive local steamer trade with Guayaquil and Panama. Pop., 1912, 11,702.

TUMBLE BUG. See Dung Beetle.

TUMBLER LOCK. See Lock.

TUMBLEWEEDS. Plants, chiefly annuals, especially abundant in prairie regions. They scatter their seeds as they are rolled or tumbled from place to place by the wind. Among the best-known plants of this sort in the United States are the Russian thistle (*Salsola pestifera*) and two tumbling pigweeds (*Cycloloma atriplicifolium* and *Amaranthus græcizans*). See Seed.

TUMBLING MUSTARD. See Hedge Mustard.

TUMOR (Lat., swelling, state of being swollen). In medicine, an abnormal increase in size of an area of tissue or of an organ; a swelling, excluding swellings occurring in the course of simple inflammation. In pathology, a tumor is an overgrowth or hypertrophy, deviating in size and shape from the normal, with an inherent power and method of growth, this growth being independent of the rest of the body. Pathologists include under the term "tumor" ulcerations and their boundaries, when such boundaries are composed in part, at least, of new tissue. Pathologically, then, a tumor is a growth of new tissue in the body which causes local increase in the size of the part or organ in which it occurs. Tumors are distinctly pathological, subserving no useful physiological purposes; in fact, usually growing at the expense of useful tissues and organs.

The tissues of which tumors are composed conform to the same general types as are normally found in the body, with the exception that in the case of some tumors there is a tendency towards the reversion of the tissue to embryonic forms. Tumors usually originate in tissues of like structure with that of the tumor itself, connective-tissue tumors taking their origin in connective tissue, epithelial tumors in epithelium, etc. When such tumors remain confined to the tissues in which they originate they are known as homologous tumors. When they spread to surrounding tissues of a different type, or when, as in malignant tumors, new tumors are started in distant tissues and organs by the dissemination of bits of tissue from the primary growth through the blood and lymph, they are known as heterologous tumors.

Some tumors are congenital, notably the nævi or vascular tumors. In some cases there appears to be a distinct hereditary tendency to tumor formation; yet ideas as to the heredity of cancer are grossly exaggerated in many minds, for, while the occurrence of cancer in several generations has been observed, the absence of cancer in the children and grandchildren of persons who have been afflicted with the most malignant forms has been equally noted. Inflammation resulting from injury, especially from long-continued slight irritation, seems to be a frequent cause of tumor formation, injuries to bone being frequently followed by development of osteosarcoma. Also injury to an organ, as from a blow or from a fall, often precedes the development of cancer. Cancer of the tongue or lip is often apparently traceable to constant irritation from a broken clay pipe or a rough tooth. In general it would seem that tumors of the connective-tissue type (sarcoma) most frequently follow a single injury, as from a blow, while tumors of the epithelial type (epithelioma, carcinoma) are more apt to occur as the result of repeated slight irritations. Chronic inflammation seems to bear some causative relation to tumor formation. This is evident in the frequent association of carcinoma of the liver with cirrhosis of that organ. Again, malignant tumors or cancer not infrequently find their starting point in such local malformations as skin nævi or moles. Age and sex play important rôles among predisposing causes of tumors. Epithelial cancer or carcinoma is rare in persons under 30 years of age. Cancer of the breast is more common in the female, this being due to the greater functional activity of that organ in the female. Cancer of the tongue and lip is much more common in the male, probably from the fact that frequent irritation from smoking is common in that sex.

Knowledge is imperfect as to the primary causative factor of tumors. Of the theories which have been advanced in explanation of tumor growth, probably the most ingenious and the one to which most credence is given is one advanced by Cohnheim. According to his theory, during embryonal development some cells stop developing. These cells may either remain in among tissues of their own kind or may become displaced in the course of further development of surrounding tissues and so come to lie among other tissues. Such cells lie dormant for long periods until something in their environment calls them into activity, when they develop with all the potential growth of young embryonal cells. Being unlimited by the wear and tear of physiological function, as is the case with normal tissues and organs, they devote their entire energies to growth. For these two reasons the high potentiality for growth of embryonal tissue and the lack of any control of the growth by the requirements of function, tumor tissue, especially of the embryonal type, is apt to be characterized by irregular, wild cell growth different from the orderly arrangement of normal tissue cells. While Cohnheim's hypothesis offers a satisfactory explanation of most of the phenomena connected with the tumor growth, it must be remembered that it is as yet purely a theory, without basis in known facts; that no one has ever been able to demonstrate any of these dormant islands of embryonal tissue waiting to be excited into tumor formation. Bacteria as excitants have been exploited by some investigators. While some believe that the true cause of cancer will ultimately be found to be bacterial in nature, the majority tend to the opinion that the presence of bacteria in tumors is an external accidental occurrence rather than an internal causative factor.

Tumors grow (1) by direct extension from the periphery, and (2) by a growth of the tumor at its centre and a consequent pushing outward of its peripheral parts, or central growth; (3) tumors also extend by what is known as metastasis. This, with the formation of what are known as metastatic tumors, occurs by dissemination of cancer cells by means of the blood and lymph. In this way bits of cancer tissue are carried to remote parts of the body. This metastasis from a single primary focus may occur in any tissue or organ, and commonly occurs in many tissues and organs either in succession or at approximately the same time. It is one of the surest evidences of the malignancy of the original tumor. These cancer cells lodging in the tissues set up new centres of growth, of the same nature as the parent growth. As the process of growth goes on in tumors so does the process of degeneration. Tumors may ulcerate or become gangrenous, abscesses may form in them, and they may undergo fatty or calcareous degeneration. Degenerative changes are more frequent in the softer, rapidly growing forms.

Various classifications have been suggested, all of which are somewhat unsatisfactory. Clinically, tumors are frequently simply divided into two classes: (1) benign tumors, or tumors which are in themselves harmless, and (2) malignant tumors, as cancer and sarcoma. The most common and as yet most satisfactory classification of tumors is morphological, based upon their structure relative to the normal body tissues. The following is the usually accepted classification:

Normal tissue	*Form of tumor*
CONNECTIVE-TISSUE TYPE	
Fibrillar connective tissue	Fibroma
Mucous tissue	Myxoma
Embryonal connective tissue	Sarcoma
Endothelial cells	Endothelioma
Fat tissue	Lipoma
Cartilage	Chondroma
Bone	Osteoma
Neuroglia	Glioma
MUSCLE-TISSUE TYPE	
Smooth-muscle tissue	Leiomyoma
Striated-muscle tissue	Rhabdomyoma
NERVE-TISSUE TYPE	
Neuromata	
VASCULAR-TISSUE TYPE	
Blood vessels	Angioma
Lymph vessels	Lymph angioma
EPITHELIAL-TISSUE TYPE	
Glands	Adenoma
Various forms of epithelial cells and associated tissues	Carcinoma

When, as is not infrequently the case, more than one kind of tissue is present in a tumor, a combination of terms is used to designate its nature. A combination of a tumor composed of embryonal connective tissue with a bony tumor is known as an osteosarcoma; a muscle-tissue tumor in which much more than the usual amount of connective tissue is present, as a fibromyoma, etc. In addition to the new growths included in the classification given there are other forms of tumors or of structures sometimes called tumors which do not fall within any of the subdivisions of the classification. Among these may be mentioned cysts of various kinds, including the so-called dermoid cyst and teratoma; such congenital tumors as moles, nævi, and angiomata, etc. The peculiar placental-tissue tumor known as deciduoma may also be mentioned.

Nonmalignant Tumors. These are composed of tissues of the types found in the adult and are in themselves not dangerous to life, although sometimes serious from pressure upon or involvement of important organs. They do not as a rule grow as rapidly as do malignant tumors; they do not tend to recur when completely removed, do not spread by metastasis, do not involve neighboring lymph glands, and do not as a rule interfere with the general health of the patient.

Fibroma.—This tumor is composed of fibrillar connective tissue of the type found in the adult. Fibromata vary even more greatly in consistency than does ordinary fibrous tissue, those containing many fibres and few cells being hard and firm, *fibroma durum;* those containing proportionately many cells being soft, *fibroma molle.* They are commonly inclosed in a definite fibrous capsule. The softer fibromata are frequently very vascular, while the harder forms usually contain few vessels. They are found in the skin and subcutaneous connective tissue, in the connective-tissue framework of the various organs, in the mucous membranes, in the intermuscular septa, in nerve sheaths, etc.

Myxoma.—Myxomata are tumors composed of tissue which resembles a type of tissue found only in extremely small amount in the adult and known as mucous tissue. Mucous tissue is therefore essentially embryonic. These growths resemble fibromata in structure, being made up of connective-tissue cells with a fibrillar intercellular substance. The softer tumors are known as *myxoma gelatinosum,* or *myxoma molle,* while those of greater consistency are known as *myxoma medullare.* Myxoma is of comparatively rare occurrence in pure form. Usually myxomata are combined with tumor tissue of other types to form complex tumors of which the most common are lipomyxoma and fibromyxoma.

Lipoma.—Lipomata are fatty tumors. They may be hard or soft depending on the amount of connective tissue present. Lipoma is a common form of tumor, being often superficial, developing in the subcutaneous fat. Lipomata may develop in any situation where fat is found and consequently have a wide distribution. They are generally inclosed in firm fibrous capsules and occur usually on the shoulders, back, or forearms.

Chondroma.—These are tumors in which the new-formed tissue resembles cartilage of either the hyaline or fibrous variety.

Osteoma.—Osteomata or bony tumors are rather rare as pure tumors. Associated with other forms of tumor tissue (as osteosarcoma, osteofibroma, etc.) they are more common.

Glioma.—Gliomata are connective-tissue tumors which follow the structure of the nervous system connective tissue, or neuroglia. Gliomata are soft and usually vascular, thus predisposing to hemorrhage. They are also extremely liable to undergo fatty degeneration. As a pure type they are rare. Associated with other forms of connective-tissue new growths, the gliosarcoma, gliomyxoma, etc., they are more common. They occur chiefly in the brain and spinal cord, the ganglia, and in the optic and olfactory nerves.

Myoma.—Myomata are tumors whose tissue elements are analogous to those found in muscle tissue. Like normal muscle, they may be divided into two forms, one in which the tissue elements are smooth, or involuntary muscle, the other in which the tissue elements are striated, or voluntary muscle. To the former the name "leiomyoma" has been given, to the latter the name of "rhabdomyoma."

Neuroma.—Neuromata are divided into true neuromata and the so-called false neuromata. True neuromata are extremely rare. They consist of nerve tissue and may be of the ganglionic type in which new nerve cells develop, or of the fibrillar type which consist of new-formed nerve fibres. Neuromata may be single or multiple, the latter frequently occurring along the branches of distribution of a single peripheral nerve. They occur in stumps after amputation of a limb and are often extremely painful. The false neuromata are not neuromata at all, but fibromata, sarcomata, myxomata, etc., of the connective tissue of the nerve trunks.

Angioma.—These tumors consist of newly formed blood or lymph vessels and are of two kinds, hæmangioma and lymphangioma. The former are subdivided into simple angioma or *angioma telangiectoides* and *angioma cavernosum*. The simple angiomata are composed of masses of blood vessels, mainly capillaries, held together by connective tissue. The so-called strawberry marks or vascular nævi, usually of the face, are congenital tumors of this variety.

Tumors sometimes Benign, sometimes Malignant. *Endothelioma.*—These tumors originate from that type of connective tissue known as endothelium which forms the linings of blood vessels, lymphatics, etc. On account of their extremely cellular character and on account of the reduction of their intercellular basement substance to a minimum, these tumors bear a close morphological resemblance to the carcinomata, among which they are often classed. Endotheliomata are most common in the pleura, peritoneum, dura mater, and pia mater. Less frequently they occur in brain, liver, ovaries, testicle, lymph nodes, salivary glands, bone, and skin. They may be single or multiple, and may form metastases.

Adenoma.—Adenomata are epithelial tumors in which the epithelium is glandular in type and is arranged in more or less distinct alveoli. They thus correspond in structure to a gland. The alveoli are supported as tumors in the irregularity of the arrangement of their component elements. Blocking up of the ducts of the glandular tissue sometimes leads to an accumulation of secretion within the alveoli and the formation of cysts. When this cyst formation is a prominent feature of the growth the term "cystadenoma" is used to designate the tumor. Of these the most important is the multilocular cystadenoma of the ovary. Most adenomata are nonmalignant, rather slow-growing tumors. The most common sites are the ovary, mammary gland, kidney, liver, submaxillary, sublingual, parotid, thyroid, and lachrymal. They also occur in those mucous membranes which are supplied with glands, e.g., the mucous membranes of the stomach, intestines, nose, pharynx, etc.

Malignant Tumors. *Sarcoma.*—Sarcomata are tumors of the connective-tissue group. They differ from connective-tissue tumors in that the connective tissue of which the sarcomata are composed is of the embryonal form. This has, as previously stated, a very distinct bearing upon their malignancy, for embryonal tissues possess much greater powers of growth than adult tissues. Sarcomata are usually classified according to the character and arrangement of their cellular elements—as small round-celled, large round-celled, small spindle-celled, large spindle-celled, giant-celled or myeloid, stellate-celled sarcoma, etc. The ends of long bones like the tibia and humerus are frequently affected. The mammary glands are sometimes the site of sarcoma, as also the sheaths of peripheral nerves. Sarcoma is as a rule an affection of early life, most common from 10 to 40, and uncommon after 40. Both sexes are about equally susceptible.

Carcinoma.—Carcinomata or cancers are malignant tumors of epithelial tissue. The epithelial elements are supported by a more or less abundant connective-tissue framework, or stroma, which forms bundles of fibres irregular in arrangement, in the meshes of which are cavities or alveoli in which the epithelial cells lie loosely without definite arrangement. Generally the epithelial cells conform to the different normal types; but we find, as is usual with all cancerous growths, an irregularity as to shape, size, and arrangement which is much more marked than in normal epithelium. And even in a carcinoma where a particular type of cell predominates, other forms of cell are frequently intermingled.

Carcinoma occurs as a primary tumor in tissues of epiblastic origin. It originates in any of the various forms of epithelium. It is not believed to occur as a primary tumor in such tissues as bone, muscle, etc., which originate in other embryonic layers. Carcinoma may, however, involve any of the body tissues. When it involves tissues other than epithelial, it is probable that the growth is secondary, the primary tumor in epithelium being so small as to have passed unrecognized.

The hard form of carcinoma common in the female breast is known as scirrhous cancer or fibro-carcinoma. Its hardness is due to the large amount of dense fibrous tissue, the cellular elements being comparatively few. Very soft carcinomata, made up chiefly of cells with a minimum amount of connective tissue, are called medullary cancer or *carcinoma molle*. Melanocarcinomata are tumors in which more or less brown or black pigment is deposited in the cells or in the connective-tissue stroma. Carcinomata whose cells have undergone mucoid degeneration or whose stroma is of the type found in mucous connective tissue are known as carcinoma myxomatoides. Gelatinous carcinoma is a form in which the cells become filled with a translucent gelatinous material.

Epithelioma.—Epithelioma is a form of carcinoma originating in squamous epithelium. The structure of the tumor tissue corresponds roughly to that of squamous epithelium as seen in the skin and mucous membranes. Epithelial cancer is most common around the orifices of the body where skin and mucous membranes unite, as around the openings of the mouth, nose, eyes, vagina, etc. Epitheliomata are the most slow growing and least malignant of all forms of cancer. They may, however, recur unless completely removed and may form metastases.

Malignancy of Tumors. Many tumors which are themselves benign in character may be dangerous to life from their position and consequent interference with the functions of important organs. Such tumors, although sometimes causing death, are not classed as malignant. A tumor to be classed as malignant must present certain well-defined characteristics. Among these may be mentioned, first, a tendency to local recurrence after removal. This has led to the rule of the surgeon when operating on cancer to cut wide of the growth, even though the tumor may seem small and insignificant, in the hope of removing all trace of cancerous tissue even at the sacrifice of some healthy tissue. It is customary in some cases to have immediate microscopical examination made of the periphery of the mass removed, to determine the presence or absence of cancer cells at the outer limits of the operation. Secondly may be mentioned the tendency of a malignant tumor to extend by direct continuity of growth to surrounding tissues. In discontinuous peripheral growth there are at first microscopic extensions outward of cancer cells from the periphery of the tumor. These grow and form nodules near, though at first separated from, the main tumor mass, but which afterward spread and usually join the original tumor. A third characteristic mark of malignancy is the formation of what are known as metastatic tumors. These are secondary growths of the same general nature as the parent neoplasm. They may occur in any tissue or organ, no matter how distant, and spring from cancer cells disseminated through the blood and lymph. From them still other metastatic tumors may arise. A fourth evidence of malignancy is the effect of the presence of the cancer upon the general health of the patient. General impairment of health is due to many factors, such as the drain upon the whole system of a rapid new growth, the absorption of injurious matter from the tumor itself, the effect of suppuration or necrosis, etc., and is known as cancerous cachexia. See Phototherapy; X Ray.

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TU′NA. See Prickly Pear.

TUNA. See Tunny.

TUNBRIDGE. See Tonbridge.

TUNBRIDGE WELLS. An English inland watering place, on the border of Kent and Sussex, 34 miles southeast of London (Map: England, G 5). Its picturesque surroundings, healthful climate, and chalybeate springs have rendered it a fashionable resort since the seventeenth century. It has a large trade in the various articles made of Tonbridge ware. The wells, discovered in 1606, are situated at the head of a promenade called the Pantiles. The principal buildings are the corn exchange, town hall, public hall, sanatorium, and mechanics' institute. The town was incorporated in 1889. Pop., 1901, 33,388; 1911, 35,703. Consult Ward, *Surrey and Sussex* (London, 1897).

TUNDRA, tụn′drȧ (Russ., from Finnish *tuntur,* marshy plain). Regions in Arctic America, Asia, and Europe, characterized as swamps of bog moss with snow-white reindeer moss and various kinds of lichens. A luxuriant growth of flowering plants is also a characteristic of some tundras. They are visited by wild birds in summer, when they are inaccessible morasses, but in winter they may be readily crossed. The soil at a depth of a few feet remains frozen throughout the year, and vegetable growth increases in thickness annually, so that the tundra surface slowly rises. Their rivers expose deep layers of ice and frozen soil, in which bones of the rhinoceros, the mammoth, and other extinct animals are found. See Alaska; Siberia.

TUNG, tŭng. See Kukui.

TUNG′STEN (Swed. *tungsten,* from *tung,* heavy + *sten,* stone), or Wolfram. A metallic element isolated by the brothers d'Elhujart in 1783, after Scheele had, in 1771, isolated tungstic acid. Tungsten is not found native, but occurs as the tungstate of iron and manganese in the mineral wolframite, as the calcium tungstate or scheelite, as the trioxide or wolfram ochre, and in small quantities in other minerals. Tungsten minerals are almost invariably found in tin ores. The metal itself may be prepared by heating sodium or calcium tungstate with carbon, and later refining in vacuo. The tungstate of sodium is obtained from tungsten ore by heating with a moderate excess of sodium carbonate, at a temperature somewhat below the melting point of the mass, subsequently extracting with water, and purifying the extracted tungstate by crystallization.

Tungsten (symbol, W (wolfram); atomic weight, 184.0) is a bright, steel-gray, hard, ordinary brittle, crystalline substance, melting at 3302° C. (5976° F.). It is used to increase the hardness and tenacity of steel and thus improve it as a material for hard tools. Coolidge has succeeded in rendering tungsten malleable and ductile, and at present drawn tungsten wire is widely used for making incandescent-lamp filaments. Tungsten combines with oxygen to form a number of oxides, including a dioxide (WO_2), a sesquioxide (W_2O_3), and a trioxide (WO_3), the latter of which unites with water to form tungstic acid, which in turn combines with bases to form a series of salts called tungstates. Of these the sodium tungstate is sometimes used to replace sodium stannate as a mordant in dyeing and printing.

TUNGSTEN INCANDESCENT LAMPS. See Electric Lighting.

TUNG′STITE. A mineral tungsten trioxide crystallized in the orthorhombic system. It is of a bright-yellow or green color. It is found with other tungsten minerals in Cornwall and Cumberland, England, and as a coating or in cavities in Monroe, Conn., and Cabarrus County, N. C. The preparation of artificial crystals of this mineral has been reported.

TUNGUS, tụn-gụz′. A group of peoples of the Ural-Altaic or Sibiric stock embracing the tribes of the Tungus proper, whose territory extends from the Yenisei to the Pacific and from the Arctic Ocean as far south as latitude 40°, and the Manchus. The Tungus proper consist of the northern Tungus, comprising the Olchas or Mangun, at the mouth of the Amur, the Oroks in the northern part of Sakhalin, the Orochons, on both banks of the Amur, the Manegers, on its left bank, east of the Orochons, and the Olennyié or Reindeer Tungus; the southern Tungus, including the Golds of the lower Amur and the Ussuri, the Oroches on the coast, and the Daurians, or Solon-Daurs, mixed with Mongols in Kulja; and the maritime Tungus or Lamuts along the Okhotsk Sea. Among some of the Tungus Shamanism of a primitive sort prevails. Russian influence, which began about 1650, is felt chiefly in the social life of the people. The Golds of the Amur, long under the influence of China, have developed an interesting ornamental art. They show considerable capacity for civilization. The Manchus are being absorbed by the Chinese, whom their ancestors once conquered. The Tungus generally are of medium height, but the Manchus are often very tall. The skull form tends to be mesocephalic. Consult: Castrén, *Grundzüge einer tungusischen Sprachlehre* (St. Petersburg, 1856); Hiekisch, *Die Tungusen* (ib., 1879); Schrenck, *Reisen und Forschungen im Amurlande* (ib., 1881–91).

TUNGUSKA, tụn-gōō'skȧ. A name given to each of the three large eastern tributaries of the Yenisei River in Siberia. They are distinguished as the Upper Tunguska, or Angara (q.v.), the Middle, or Stony Tunguska, and the Lower Tunguska.

TUNGUSKA, Lower. The northernmost of the three chief tributaries of the Yenisei River in Siberia (Map: Asia, L 2). It rises on the Vitim Plateau in the Government of Irkutsk, about 200 miles northwest of Lake Baikal, and within 14 miles of the Lena River, and flows first north, then northwest, joining the Yenisei above Turukhansk, not far from the Arctic Circle, after a course of 1600 miles. Its upper course flows between low banks covered with pine forests, but lower down the banks become higher and rocky, and the river penetrates a range of mountains in a series of rapids. The river is navigable about 450 miles, but it is frozen in its lower course for seven months in the year. The ice here blocks the upper waters in the spring, causing extensive inundations.

TUNÍCA tōō-nē'kȧ. A North American Indian linguistic stock. See Toníca.

TU'NICA'TA (Lat. nom. pl. of *tunicatus*, p.p. of *tunicare*, to clothe with a tunic, from *tunica*, tunic). The single class of the Urochorda containing small marine animals inclosed in a soft elastic tunic, which opens by two apertures (oral and anal), and contains tunicin, a substance resembling cellulose. The tunic is usually thick, tough, and leathery, but may be thin and delicate, especially in some of the smaller forms. The mouth, supplied with tactile organs, opens into a capacious pharynx, which contracts abruptly into a narrow œsophagus, then expands into a stomach, followed by a more or less coiled intestine that terminates close to the atrial pore or orifice (the other opening in the tunic). The walls of the pharynx are perforated by numerous slits, through which the water entering at the mouth passes into the cavity of the tunic and thence escapes through the atrial pore, carrying waste matter, reproductive products, etc. The pharynx is an important respiratory organ and is correspondingly richly supplied with blood vessels. The heart is peculiar, in that it reverses its beating, pumping the blood in one direction for a time, then pausing and pumping the blood in the other direction for an equal length of time. The nervous system, contrary to common belief, is not greatly reduced, although sense organs (except touch) are wanting or but slightly developed. The muscular system is well developed in some forms, especially in the tunic, but in others it is reduced and serves chiefly for closing the oral and atrial pores. Reproduction is not only by eggs, but takes place in many forms also by budding. In size and color the tunicates offer great diversity. The smallest forms are, as individuals, only a few millimeters long, though the colonies they form are often many inches in diameter. The largest individuals are six or eight inches high, though some forms are on stalks of much greater length. In color we find some species black and some species white, and others red, but dull shades of greenish, grayish, or brownish are more common. Many free-swimming forms are almost transparent and nearly colorless.

The number of species is large and the classification has varied greatly with different writers. They are a comparatively well-defined group and are now considered as a considerably degenerated offshoot of the branch from which the Chordata have arisen. (See Ascidian.) The tunicates may be conveniently divided into three orders, Larvalia, Thaliacea, and Ascidiacea. The Larvalia are a very small group, containing only one family and few species, remarkable for their small size and free-swimming habits, and the retention throughout life of certain characters which in the other orders occur only temporarily during development. These larval characters are especially the tadpole form with a tail, the nerve cord, and the persistent notochord or urochord. The Thaliacea are also free-swimming, but are much larger and more degenerate or specialized forms. There are three families, one of which contains the beautiful salpas (q.v.). The order Ascidiacea contains three suborders and a dozen or more families. One suborder is free-swimming like the salpas, and so is called the Salpiformes; the second, called Compositæ, contains fixed forms which multiply extensively by budding and thus form compound organisms, the individuals of which are usually very small; the third suborder, the Simplices, are almost always fixed individuals (see Ascidian); but in many cases large numbers of individuals are united by a common stolon from which they have arisen by budding, and these forms are sometimes known as social ascidians. The simplices are better known, popularly, than the other suborders, and many of them have popular names, as sea pork, sea peach, sea potato, and sea squirt.

Consult Herdman, "Report on the Tunicata," in Thomson and Murray, *Report of the Scientific Results of H. M. S. Challenger: Zoölogy*, vol. vi (London, 1888), and general works on zoölogy.

TU'NICLE. See Costume, Ecclesiastical.

TUNING. The process of bringing into perfect musical accord the strings, pipes or membranes which constitute tone-producing elements of the various musical instruments. As a rule the wind instruments do not require special tuning, for their pitch is constant. Keyed instruments (the piano and organ) require only occasional regulation of their strings and pipes; but the stringed instruments need to be tuned constantly. See Musical Instruments; Pitch; Temperament.

TUNING FORK. A contrivance for regulating the pitch of the voice or of a musical instrument. It consists of two prongs of steel springing from a handle, and so adjusted as to produce a fixed note when struck. It is tuned in a^1, which has 435 double or 870 single vibrations per second. The *tuning-cone* is a hollow, metal cone used in tuning the metal flue pipes of an organ. To lower the pitch of a pipe, the inverted cone is pushed down over its top; to raise the pitch, the point of the cone is inserted in the pipe.

TU'NIS (Fr. *Tunisie*). A French protectorate in North Africa. It is the most northern of African countries (Map: Africa, E 1). Its boundaries are still indefinite, but the area is probably less than 50,000 square miles. Tunis is physically continuous with the rest of northwestern Africa. The northern part is composed of the Little Atlas Mountains which border the coast, the Great Atlas to the south on an average about 1500–2000 feet, rising in the peak of Sidi Ali, and in other summits to heights of 5700–6500 feet and the inclosed plateau. This plateau region is fairly well watered by numerous small streams, many of which are perennial, and the valley of the Mejerda (ancient Bagradas), a stream which regularly overflows its banks during the winter rains and irrigates the neighboring plains, is the chief area of cultivation. The southern half of the plateau, generally treeless, is covered with esparto grass. On the north coast the plateau falls abruptly in steep wooded cliffs towards the sea; on the east coast, however, there is a low region about 60 miles wide, fertile in the north, but becoming arid in the south. The southern half of Tunis belongs to the Sahara region, and, with the exception of a group of mountains in the southeast, is generally low, in some places even below sea level. In its northern part is the salt incrusted area of the Jerid, surrounded by numerous hot springs, which are used for irrigation. The date palm is here indigenous, and grows in large numbers, but the rest of the Sahara region is arid. The climate of Tunis is healthful, with a temperature ranging from 50° F. to 96° F. The rainfall averages 22 inches in the north, and is there fairly regular. In the south years may pass without any regular rains, though occasionally there are heavy showers which raise the average to nearly ten inches. The flora and fauna are mostly identical with those of Algeria (q.v.). Geologically Tunis is of comparatively recent formation, the mountains being mostly Tertiary, the coast region Quaternary, and parts of the plateau Cretaceous.

The chief mineral products are zinc, lead, iron, salt, gypsum, phosphates, and marble. In recent years, by far the greatest development has been in phosphates. Agriculture, the main industry, shows progress. Cereals and the vine are mainly cultivated in the northern part, where the holdings are small. Farther south the holdings are large and devoted to stock-breeding and the cultivation of olives (about 500,000 acres) and date palms. The chief products are olives and olive oil, grain, fruits, and cork. The leading acreages in 1913 were 1,518,000 for wheat and 1,374,000 for barley. In 1913 there were 29,500 horses, 84,200 asses, 23,500 mules, 157,100 cattle, 843,100 sheep, 561,700 goats, 123,900 camels, and 15,100 swine. Tunis has practically no industries except the native or household. Carpets, saddles, and other leather articles and woolen goods are produced. The fisheries are active and yield principally allaches, sardines, tunny, and sponges. There are sixteen ports, three of them excellent. In 1913 the tonnage entered was 4,666,000, about three-fourths French. Imports and exports in 1912 were valued at 156,294,000 and 154,655,000 francs, respectively; in 1913, 144,254,000 and 178,663,000. The leading exports are phosphates, cereals, olive oil, live animals, and lead. About one-half the total trade is with France. At the beginning of 1914 there were 1428 miles of railway.

The French protectorate dates from 1881. The nominal head of the government is the native Bey, assisted by nine ministers—seven French and two native—who administer nine departments. There is also the Minister of Foreign Affairs, who is the French Resident-General. He is virtually the Viceroy. Tunis has thirteen civil and two military districts and a military post—all in charge of French representatives. French tribunals of justice deal with cases involving foreigners, and native courts with those of the Tunisians. The army of occupation in 1913 numbered 17,500. The capital is Tunis (q.v.). The estimated revenue and expenditure for 1913 were each about 85,000,000 francs. The largest disbursements are for the public debt and public works. The total debt at the end of 1906 amounted to £9,287,000; in 1910 a loan of 10,000,000 francs was authorized.

The census of Europeans, Dec. 15, 1911, and the estimate of Mohammedans and native Jews, Dec. 31, 1911, showed a total population of 1,929,003. Mohammedans numbered 1,730,144; Italians, 88,082; native Jews, 50,383; French, 46,044; Maltese, 11,300; various, 3050. There are some French and many Mohammedan schools, a Mohammedan university in Tunis, and a college. Tunis is rich in antiquities. Punic, Roman, and Byzantine ruins abound, the two former classes representing magnificent epochs. The site of Carthage is still marked by the remains of substructures. A fine museum of relics has been established here. The Bardo collection near the capital is valuable.

The early history of Tunis is connected with that of Carthage (q.v.). After the fall of Carthage the region became the Roman Province of Africa (Africa in the narrower sense), subdivided into the northern District of Zeugitana and the southern district of Byzacium (Provincia Byzacena). Carthage was rebuilt, and in the second and third centuries of the Christian Era was one of the most important cities of the Roman Empire. The Romans were vanquished by the Vandals under Genseric in 429. The Vandals held the country until their King, Gelimer, was conquered and taken prisoner in 534 by Belisarius (q.v.), the general of the Byzantine Emperor Justinian. Tunis then remained under Byzantine rule until the conquest by the Arabs in the seventh century. Under Mohammedan rule the city rose to great splendor. After having formed for more than a century a part of the dominions of the caliphs, the country was ruled successively by the dynasties of the Aglabites, Fatimites, Almohades, and Hafsites. In the middle of the twelfth century it was for a short time under the rule of Roger II of Sicily. In 1270 Louis IX of France, having undertaken a crusade, died during his invasion of Tunis, and in 1390 the French under the Duke of Bourbon were again unsuccessful, being repulsed at Mahdiya. In 1535 Charles V undertook an expedition against the famous corsair Khair-ed Din (Barbarossa), who had established himself at Tunis, captured the city, and liberated over 20,000 Christian slaves. In 1575 Sinan Pasha conquered the country and incorporated it with the Ottoman Empire. The government was placed in the hands of a Turkish pasha, a divan or council, composed of the officers of the Turkish garrison, and the commander of the janizaries.

After a few years, however, an insurrection of the soldiery broke out, and a new government was established, the head of which was a "dey" possessing limited authority, the chief power being at first exercised by the military divan.

But gradually an officer, with the title of "bey," whose original functions were confined to the collection of tribute and taxes, acquired a supremacy over the other authorities, and finally obtained a kind of hereditary sovereignty. The beys of Tunis made conquests on the mainland and piratical enterprises against Christian powers at sea. During the eighteenth century Tunis became tributary to Algeria. About the beginning of the nineteenth century Hamuda Pasha put an end to this dependence, subdued the Turkish militia, and created a native Tunisian army, in consequence of which Tunis virtually attained independence. The subsequent rulers, Achmet Bey (1837–55), Mohammed Bey (1855–59), and Mohammed Sadyk Bey (1859–82), were liberal, enlightened sovereigns. In 1871 the Sultan renounced the tribute formerly exacted, and fixed the future relations of the Sublime Porte to Tunis. The Bey was to receive his investiture from Constantinople; without the Sultan's authority he could neither declare war, conclude peace, nor cede territory; the Sultan's name was to appear on all the coinage; the army was to be at the disposal of the Porte. In internal matters, however, the power of the Bey was to be absolute. In 1881 France, with the ostensible purpose of chastising the Khrumirs, who had made raids into Algerian territory, sent an expedition into Tunis. At the same time a French squadron appeared before the capital and the Bey was forced to enter into an engagement establishing a French protectorate over the country. Thereupon an insurrection broke out, and it was only after much bloodshed that the French were able to compel submission. In July, 1881, they took Sfax, and in October they occupied Kairwan. By the close of the year the country was subdued. The French protectorate has contributed to the material progress and prosperity of Tunis.

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TUNIS. The capital of the Protectorate of Tunis. It is situated near the southwestern extremity of the Lake of Tunis, about three miles from the ruins of ancient Carthage (Map: Africa, F 1). The lagoon or Lake of Tunis is shallow, and communicates with the Gulf of Tunis, an inlet of the Mediterranean, by a narrow strait known as the channel of Goletta. The gulf itself is 45 miles broad at the entrance. The town occupies rising ground, and both the city proper and the suburbs are surrounded by walls. The streets of the inner town are narrow, unpaved, and dirty, but the bazars are well furnished, and many of the mosques are splendid, particularly the Mosque of Yussuf. The palace of the Bey is probably the finest building in Tunis. The citadel, begun by Charles V and finished by Don John of Austria, is interesting from its collection of old arms. The newer French or foreign quarter, established since 1893, has a European aspect. The city contains a Mohammedan university and a national museum of arts and antiquities. Water is supplied by means of a restored ancient aqueduct from Jebel Zaghwan. Tunis is the commercial centre of the State, and carries on an important trade with Europe and Central Africa. Ocean-going vessels reach the town directly by means of a canal, 7 miles long and 21½ feet deep, opened in 1893. Tunis has silk and woolen manufactures of shawls, tapestries, mantles, burnooses, caps, turbans, colored cloths; also leather, soap, wax, and olive oil, all of which it exports, together with grain, fruits, cattle, fish, ivory, gold dust, coral, etc. The climate is unhealthful.

Tunis (ancient *Tunes*) was a Carthaginian city, frequently mentioned in connection with the Punic wars. It became important under the Arabs. (See TUNIS, Protectorate.) The population is stated for the end of 1911 to consist of about 164,600 Moslems, 43,000 Jews, and about 69,500 Europeans (including 44,237 Italians, 17,875 French, and 5986 Maltese).

TUNJA, tōōn′hȧ. A city and the capital of the Department of Boyacá, Colombia (Map: Colombia, C 2). It is located 9161 feet above the sea and has a cold healthful climate, with an average temperature of 55° F. It has straight paved streets and around the Plaza de Bolívar are the cathedral, the government house, and the college. There are also a penitentiary, a normal school and a seminary. The city manufactures tiles and bricks. Stock-raising, mining, and some agriculture are carried on in the surrounding region. Pop., 1912, 8971. It was founded in 1539 by Gonzalo Suárez Rendón, on the site of the Chibcha town of Zaque Hunza. Near the city is the Boyacá bridge where Bolívar won the decisive battle of that name on Aug. 7, 1819.

TUNKERS. See CHURCH OF THE BRETHREN.

TUNKHAN′NOCK. The county seat of Wyoming Co., Pa., on the Susquehanna River, Tunkhannock Creek, and the Lehigh Valley Railroad, 31 miles by rail northwest of Wilkes-Barre (Map: Pennsylvania, K 3). The chief industry is tanning and there are spool and tub factories, furnaces and machine shops, stave and planing mills, and witch hazel distilleries. Lumbering is carried on extensively. Pop., 1900, 1305; 1910, 1598. For description of TUNKHANNOCK VIADUCT, see VIADUCT.

TUNNEL (OF. *tonnel*, tunnel, tun, pipe, *tonnelle*, arbor, arched vault, tunnel, diminutive of *tonne*, pipe, tun, ML. *tunna*, OHG. *tunna*, Ger. *Tonne*, AS. *tunne*, Eng. *tun*). An artificial gallery, passage, or roadway beneath the ground, under the bed of a stream, or through a hill or mountain. Tunneling has been known since very early times. A king of Egypt upon ascending the throne began at once to drive the long narrow passage leading to the chamber of the rock-cut tomb at Thebes which was to form his final resting place. Similar rock-cut work was performed by the Nubians and Indians in building their temples, by the Aztecs in America, and by most ancient civilized peoples. The first built-up tunnels known were those constructed by the Assyrians. The vaulted drain or passage under the southeast palace of Nimrud, built by Shalmaneser II (860–824 B.C.), is in essentials a true soft-ground tunnel. A much better example is the tunnel under the Euphrates, which may be claimed to be the first subaqueous tunnel of which any record exists. It was, however, built under the dry bed of the river, the waters of which were temporarily diverted and then turned back into their normal channel after the tunnel work was completed, making it a true subfluvial tunnel only when finished. The Euphrates tunnel was built through soft ground, and was lined with brick masonry, 12 feet wide in its interior and 15 feet high. Only hand work was employed in ancient tunnel construction. In soft ground pick and shovels or scoops were used. For rock work the ancients possessed a greater range of appliances.

Research has shown that among the Egyptians, by whom the art of quarrying was highly developed, use was made of tube drills and saws with cutting edges of corundum or other hard, gritty material. The usual tools for rock work were the hammer, chisel, and wedges; and the excellence and magnitude of the works accomplished with these limited appliances attest the unlimited time and labor available for their accomplishment.

The Romans should doubtless rank as the greatest tunnel-builders of antiquity in the number, magnitude, and useful character of their works and in the improved methods they devised. They introduced fire as an agent for breaking down the rock, and developed the familiar principle of prosecuting work at several points at once by means of shafts. They built large fires in front of the rock to be broken down and when it had reached a high temperature cooled it suddenly by means of water, thus producing cracks and fissures.

The Roman tunnels were designed for public utility—aqueducts and roads. One of the most notable of the tunnels of larger section is that which gives the road between Naples and Pozzuoli passage through the Posilipo hills. It is excavated through volcanic tufa, and is about 3000 feet long and 25 feet wide, with a section in the form of a pointed arch. In order to illuminate this tunnel, its floor and roof were made gradually converging from the ends towards the middle; at the entrances the section was 75 feet high. This double funnel-like construction caused the rays of light to concentrate as they approached the centre, improving the natural illumination. This tunnel was probably excavated during the time of Augustus, although some authorities place it earlier.

During the Middle Ages tunnel-building was practiced for military purposes, but seldom for public need. Every great castle had its private underground passage from the central tower or keep to some distant concealed place to permit the escape of the family and its retainers in case of victory by the enemy, and during the defense to allow of sorties and the entrance of supplies. The tunnel-builders of the Middle Ages added little to the knowledge of the art. Indeed, until the seventeenth century and the introduction of gunpowder no particular improvement was made in the tunneling methods of the Romans. Although gunpowder had been previously employed in mining, the first important use of it in tunnel work was at Malpas, France, in 1679–81, in the tunnel for the Languedoc Canal. This tunnel was 510 feet long, 22 feet wide, and 29 feet high, and was excavated through tufa.

With the advent of gunpowder and canal construction the first strong impetus was given to tunnel-building in its modern sense as a commercial and public utilitarian construction. Canal tunnels of notable size were excavated in France and England during the latter half of the seventeenth century. These were all rock or hard-ground tunnels. Indeed, previous to 1800 the soft-ground tunnel was beyond the courage of the engineer except in sections of such small size as hardly to deserve the name of tunnels. In 1803, however, a tunnel of 24 feet wide was excavated through soft soil for the Saint-Augustine Canal in France. Timbering was employed to support the walls and roof as fast as the earth was removed and the masonry lining was built closely following it. From the experience gained in this tunnel were developed the various systems of soft-ground subterranean tunneling since employed.

In 1761 coal was shipped in boats from the Duke of Bridgewater's coal mines over a canal from Worsley Mill to Manchester. At Worsley, where the basin was large enough to hold a great many boats, the canal entered a hill by a tunnel which at the time of its construction was about a mile in length and reached the different workings of the mine. It has since been enlarged and comprises about 40 miles of subterranean water passage.

It was through the development of the steam railway, however, that the art of tunneling was to be brought into its present prominence. The Terre-Noir (Black Earth) was the first tunnel built on a horse railroad. It was on a single-track road near St. Etienne, in France, on the Roanne-Andrézieux line. It was begun in 1826 and was 4921.5 feet long, 9.8 feet wide at the springing line, and 16.4 feet in height. In Belgium, the Cumptieh Tunnel was built in 1835 on the Chemin de l'Etat, and seems to have been the earliest in that country. It was single track and 13.7 feet wide at the springing line. The Oberau Tunnel, 1680 feet long, was completed in 1839 on the Leipzig-Dresden line in Saxony. This was the first German tunnel. In Austria, the Gumpoldskirch Tunnel on the Vienna-Gloggnitz line near Wiener-Neustadt was built in 1839. In Italy the Naples-Castelamare line, opened in 1840, had several tunnels on it. In 1856 the total Italian tunnels amounted to 10,181 meters. In Switzerland the Hauenstein Tunnel, finished in 1858, is of interest. The first tunnel built in the United States was in the Schuylkill navigation canal above Auburn, at the Orwigsburg landing, commenced in 1818 and opened to traffic in 1821. It was cut through red shale, 20 feet wide by 18 feet high (from canal bottom) and was originally 450 feet long, arched for about 75 feet inward from each portal. The highest point of the hill over the tunnel was only some 40 feet, and had it been located but a short distance down the ridge, where the railway cut now is, the tunnel might have been eliminated. In order to get sufficient height to tunnel under, it was necessary to turn the course of the canal at almost right angles to itself. The novelty of this tunnel was a great factor in promoting general interest in the canal. In 1834–37 the tunnel was shortened to about half its original length, in 1845–46 it was enlarged in width to 22 feet and further shortened to a length of 160 feet, and in 1855–56 it was wholly taken out; so that the first American tunnel no longer exists. Even the names of the engineers who located and built it are not known. The first railway tunnel in the United States was built on the Allegheny Portage Railroad in Pennsylvania in 1831–33.

MODERN TUNNELING

The art of tunneling entered its last and greatest phase with the construction of the Mont Cenis Tunnel in Europe and the Hoosac Tunnel in America. The Mont Cenis was undertaken to facilitate railway communication between Italy and France, or, more properly, between Piedmont and Savoy, the two parts of the kingdom of Victor Emmanuel II separated by the Alps. It is 7.6 miles long and passes under the Col de Fréjus near Mont Cenis. Work was begun in 1857 and finished in 1870. It was from the close study of some of the difficulties, the great length of the tunnel, and the desire of the engineers to finish it quickly, that all the different improvements were developed which marked this work as a notable step in the advance of the art of tunneling. Thus the first power drill ever used in tunnel work was devised by Sommeiller, one of the engineers. In addition compressed air as a motive power for drills, aspirators to suck the foul air from the excavation, air compressors, turbines, etc., found here their first application to tunnel construction. This important rôle played by the Mont Cenis Tunnel in Europe in introducing modern methods had its counterpart in America in the Hoosac Tunnel, completed in 1875. For the first time in America power rock drills, air compressors, nitroglycerin, electricity for firing blasts, etc., were used. There remains now to be noted only the final development in the art of soft-ground submarine tunneling—the use of shield and metal lining. The shield was invented and first used by Sir Marc Isambard Brunel in excavating the first tunnel under the River Thames at London, begun in 1825 and opened in 1843. In 1869 Peter William Barlow used an iron lining in connection with a shield in driving the second tunnel under the Thames at London. From these inventions has grown up one of the most notable systems in tunneling now practiced, known as the shield system. In addition, as will be discussed below, where depth permits, subaqueous tunnels are now constructed by sinking steel tubes in a trench dredged in the river bottom and surrounding and lining them with concrete. This method was first used on the Detroit River tunnel, completed in 1910 with 10 sections having a total length of 2625 feet.

Construction. Tunnels may be classified, according to the general nature of the materials penetrated, into hard-rock tunnels and soft-ground tunnels. Whatever the material penetrated, the general methods of construction are the same, but many differences in detail exist. In certain kinds of tunnels, such as those under water and those under city streets, other conditions than hardness of material penetrated exercise a controlling influence. For description, therefore, it is common to classify tunnels into hard-rock, soft-ground, open-cut, and submarine tunnels. In open-cut and submarine tunnels the material penetrated may be either rock or earth. When it has been decided to construct a tunnel the first task is to construct a geological map which will show as accurately as possible the character and inclination of the earth's strata to be penetrated, the probability of water being encountered, etc., all of which exercise an important influence upon the difficulties and cost of the work. The next step is to establish exactly the centre line of the tunnel; this is done on the surface of the ground, and its purpose is to find the exact length of the tunnel and to furnish a reference line by which excavation is directed. The determination of the centre line is a simple problem in surveying, requiring only skill and exactness; the longer the tunnel, and the higher and more inaccessible the mountain is above it, the more difficult the work. So perfect, however, has the skill of the surveyor become that it is a common thing to work within a small fraction of a foot in alignment in driving a long mountain or submarine tunnel.

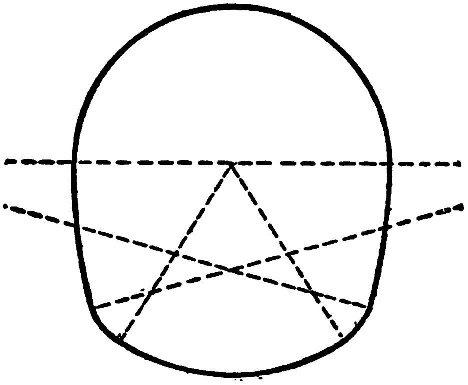


FIG. 1. DIAGRAM SHOWING CROSS SECTION OF POLYCENTRIC FIGURE.

The centre line being established, the next step is to find the difference in elevation of the two ends. The form and dimensions of the cross section of the hole or passageway which it is proposed to excavate are then decided upon. The form and dimensions of cross section adopted are determined by the purpose to which the tunnel is to be put and by the character of the material penetrated. The best form for the majority of conditions, and the one most commonly employed, is the polycentric figure (Fig. 1), in which the number of centres and length of the radii are fixed by the engineer to meet the particular conditions which exist. The dimensions to be given to the cross section of a tunnel depend upon the purpose for which it is to be used, as will be observed in the succeeding descriptions of prominent tunnels. In all cases the form and the dimensions are those of the inside of the completed tunnel, which is of course the inside of the lining in all cases except those of unlined hard-rock tunnels, where it is the inside of the original excavation.

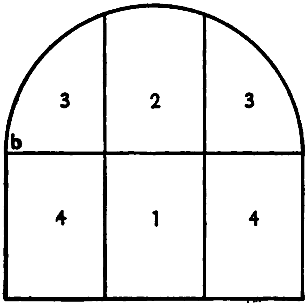


FIG. 2. DIAGRAM SHOWING SEQUENCE OF GALLERIES IN DRIFT METHOD OF HARD-ROCK TUNNELING.

Excavation. The work so far described is of the nature of engineering investigation and design. The actual construction of work consists in excavating in the earth or rock a passageway which follows the established centre line and conforms in dimensions and shape to the established cross section. In performing this work the whole area of the cross section is seldom removed at once, but it is subdivided into two or more galleries, which are excavated in a measure independently of each other and which together form the full cross section. The objects of thus subdividing the work are several in number, the more important being as follows: By driving a number of galleries each somewhat in advance of the succeeding one, several gangs of men can be worked without interfering with each other; the first gallery, being driven far ahead, serves to drain the earth and to disclose in advance the nature of the material to be encountered; in soft material several small galleries can be driven and timbered with much less danger of caving than one large gallery. The number and arrangement of the galleries vary with the materials penetrated and with the system of tunneling adopted. The first gallery excavated is called a heading when it is situated at the top of the cross section, and a drift when it is situated at the bottom of the cross section. The excavation of the main sections is termed enlarging the profile.

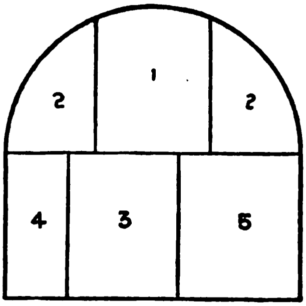


FIG. 3. DIAGRAM SHOWING SEQUENCE OF GALLERIES IN EUROPEAN HARD-ROCK TUNNEL.

Two general methods of excavating rock tunnels are considered practical by engineers; in one the profile is enlarged from a drift and in the other it is enlarged from a heading. The sketch Fig. 2 shows the usual sequence of galleries by which the full cross section is enlarged from a drift. This method of excavation is quite commonly practiced in Europe, but seldom in America. Among the most notable tunnels built by enlarging a drift are the Mont Cenis and the Simplon, both of which are more fully described farther on. The more common method of tunneling in America through hard rock is the heading and bench method. In the more recently driven tunnels it has been found that the best results can be obtained by keeping the bench close up to the heading so that the broken rock from the heading will be thrown back by the blasting and can be handled at the same time as the bench. This heading may be of small dimensions and the remainder of the section may be removed in successive small parts, or it may be the full width of the section and the enlargement completed in one other cut. When the tunnel is excavated by means of several cuts, the method usually employed in Europe, the sequence of galleries is indicated by Fig. 3. When the excavation is made by a single wide heading and a single other cut for removing the bench, the method preferred by American engineers, the sequence of galleries is the simple one indicated by Fig. 4. The St. Gotthard Tunnel, described farther on, is one of the most notable tunnels excavated by enlarging a heading by means of several cuts; the Cascade Tunnel in Washington is a notable example of the wide heading and single-bench method. In the Rogers Pass Tunnel in British Columbia a pioneer tunnel was driven from each end parallel with but quite independent of the main tunnel. This was done because it was impossible to use vertical shafts, and by making cross cuts to the main line it was possible to prosecute the work from several faces at once.

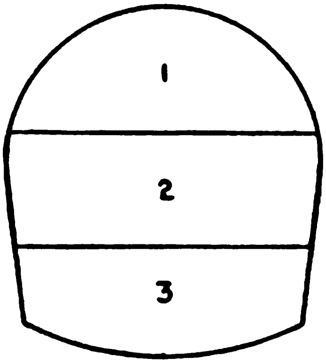


FIG. 4. DIAGRAM SHOWING SEQUENCE OF GALLERIES IN AMERICAN HEADING METHOD OF HARD-ROCK TUNNELING.

In all rock tunnel work the various galleries are excavated by drilling and blasting the rock. The most difficult gallery to excavate is the first heading or drift, as the case may be. Based on the mode of blasting employed, there are two methods of driving the advance gallery, known as the circular and the centre-cut methods. In the first method a set of holes is first drilled near the centre of the front in such a manner that they inclose a cone of rock; the holes, starting at the perimeter of the base of the cone, converge towards a junction at its apex. Seldom more than four to six holes are comprised in the first set. Around these first holes are driven a ring of holes which inclose a cylinder of rock, and if necessary succeeding rings of holes are driven outside the first ring. These holes are blasted in the order in which they are driven, the first set taking out a cone of rock, the second set enlarging this cone to a cylinder, and the other sets enlarging this cylinder.

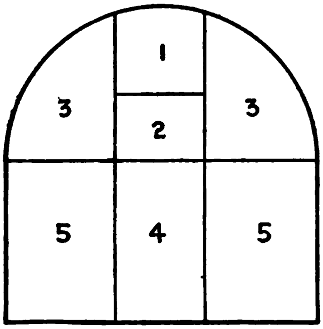


FIG. 5. DIAGRAM SHOWING SEQUENCE OF GALLERIES IN BELGIAN METHOD OF SOFT-GROUND TUNNELING.

The success of the work is largely due to the number and length of the holes and the way they are placed. The centre cut with holes from 6 to 12 feet deep is the method mostly used in America, although the greater speed has been attained by the use of shorter holes, four to four and one-half feet deep and a greater number; but it has generally been conceded that on account of the greater quantity of powder consumed this method is more expensive. The holes in the bench are generally put in by power drills mounted on tripods and the holes drilled vertically in a line at right angles to the centre line of the tunnel; the number of holes which are necessary depends wholly on the hardness of the ground. In the large tunnels air-operated steam shovels have been used to take out the muck, but in the majority of tunnels the muck is shoveled into cars by hand and the cars moved by animal or electric power. In conclusion it may be stated that the present high development of labor-saving machinery for excavating rock makes this material one of the safest and easiest to tunnel with which the engineer ordinarily has to deal. A necessary equipment for tunneling through rock requires a steam, electric, or a water-power plant for pumping air under pressure and supplying light and power, and in large tunnels these power plants are often of considerable size. See BLASTING; DRILL.

Soft-ground tunnels are worked in a variety of ways which have been classified according to the country in which they originated, as English, Belgian, Austrian, and American. Obviously the classification, though widely accepted, is far from strict, because each method has many variations, nor has any method been confined to the country for which it was named. The English method is to remove the entire section in short lengths, usually from 12 to 20 feet in advance of a permanent lining. The masons and miners alternate in the possession of the face, and the work of excavation and the building of masonry is uninterrupted until each is completed for the length. A small drift is generally driven at the bottom of the tunnel section from end to end of the tunnel, both for the purpose of ventilation and drainage and for the establishment of the centre line underground. It also allows the tunnel to be attacked at several points. The main excavation always begins at the top of the tunnel; two roof bars are then placed in this opening with their forward ends resting on posts and their rear ends resting on the completed masonry, transverse polings are then driven over these bars, and the heading is widened for the length of the roof bars. The vertical breast boards are placed under the transverse poling and new side bars placed. When the ground is stiff enough the poling is not driven over the side bars but placed against the roof after excavation. This operation is continued down the sides as far as required by the nature and pressure of the ground. Sometimes it is necessary to carry it to the bottom and at the same time keep the face boarded up and firmly braced against the completed lining. The miners now give way to the masons, who construct a length of lining within the timber and the operation is repeated. This method is best adapted to very firm ground, but has been used successfully in heavy and wet ground. The advantages consist chiefly in a large open space in which the masonry can be built up and the facility with which the muck can be handled. The disadvantages are that the miners are laid off half the time, the work thus delayed, and part of the timbering is laid on green masonry.

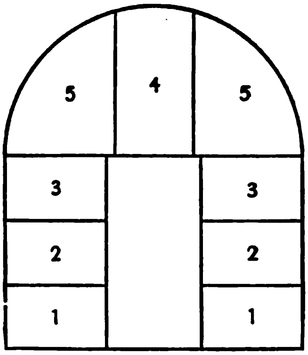


FIG. 6. DIAGRAM SHOWING SEQUENCE OF GALLERIES IN GERMAN METHOD OF SOFT-GROUND TUNNELING.

In the Belgian method the upper half of the tunnel is excavated much in the same manner as in the English, except that the excavation is frequently carried considerably farther ahead of the masonry. A cut is then excavated through the centre half of the tunnel to the invert, leaving a berm on either side to support the arch of the tunnel lining. From the centre trench narrow cuts are made at intervals to the side and the masonry arch is underpinned, the cuts are widened, and the underpinning is extended until a complete side wall is built, and finally the invert is placed. The greatest advantage of this method is the fact that in firm material the successive steps can be carried on at a number of different places, so that the work is hastened. The worst feature of this method is that the arch is first carried on earth, then on timber, both of which are liable to settle unevenly.

The German method in its most characteristic form consists in driving two separate headings at the foot of each side wall. The invert is put in last, but the rest of the lining is built from the bottom up, the side walls being built up in the two headings as high as possible, then on top of these headings two others are driven and the walls brought up to this level; so on until the side walls are joined in the centre heading at the top. In practice only two headings are used, and this brings the wall up to the spring line of the arch, which is placed by widening out the centre top heading. The advantage of the German method is that a large centre core of earth is left upon which the timbering can be braced, and also as the openings are small the danger of large cave-ins is decreased. The method is not widely used, however, as the disadvantages, viz., cramped quarters and bad ventilation, overbalance the advantages.

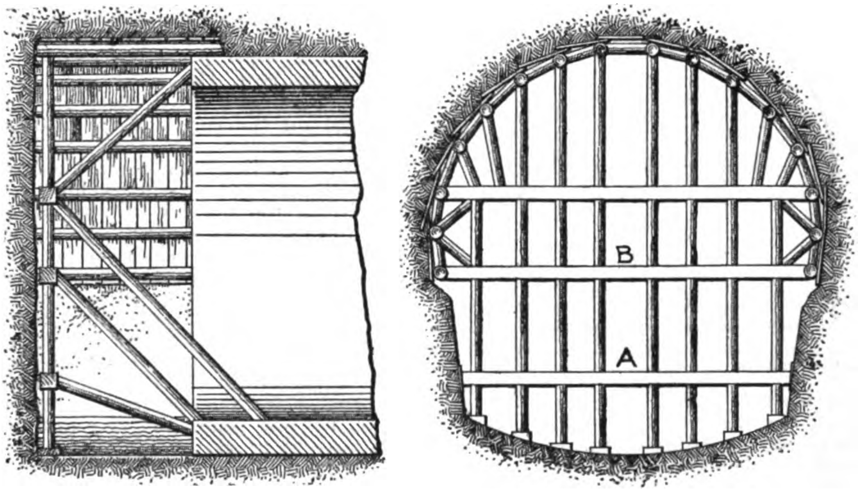
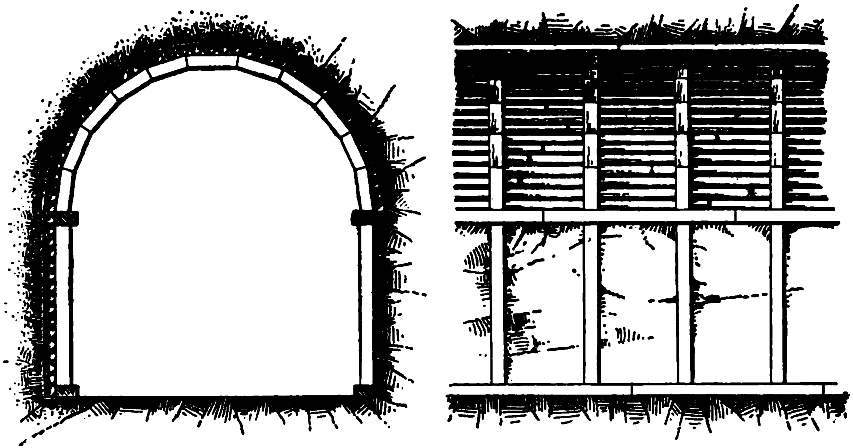


FIG. 7. SYSTEM OF STRUTTING PRACTICED IN ENGLISH METHOD OF SOFT-GROUND TUNNELING.



Cross Section, Longitudinal Section.

FIG. 8. A TYPICAL FORM OF TIMBER LINING FOR TUNNELS.

In its final development the Austrian system is characterized by very strong timber supports. It commences with the centre bottom heading, and immediately above this is driven another heading extending to the top of the masonry arch. This last heading is enlarged laterally until it includes the whole arch area, and finally the bottom heading is enlarged laterally until it includes the side-wall area. The side walls are built first, the arch is then placed, and the invert goes in last.

In the so-called American method the centre top heading is usually driven, and this is enlarged sideways to include the entire arch area. Sills are then placed and an arch of segmental timbers is made and placed which carries the roof. Over these arches longitudinal lagging is usually placed, and the space between the ground and lagging is packed with loose rock. The bench is usually taken out in two layers and permanent posts set under the arches; this leaves the whole of the tunnel opened and tracks may be laid and trains run before permanent lining is placed. In many tunnels this was the only lining used for several years after the tunnel was completed.

Tunnels are usually lined even in hard rock to avoid danger from falling rocks which may be shaken loose under constant traffic. The lining is usually brick, stone, or concrete, but in some cases cast iron has been used. Cast iron is usually placed in subaqueous tunnels where the space is limited and a strong lining is necessary. Concrete has been found to be very serviceable and cheaper to place than brick or stone.

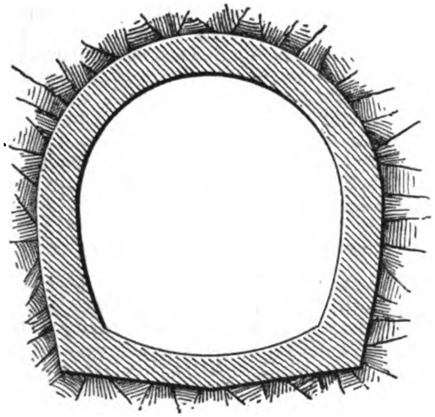


FIG. 9. CONCRETE LINING FOR TUNNELS.

Open-Cut Tunneling. When a tunnel or rapid-transit subway has to be constructed at a small depth below the surface, the excavation is generally performed more economically by making an open cut, building the lining inside it, and filling in the space outside the lining, than it is by subterranean tunneling proper. The necessary condition of small depth which makes open-cut tunneling desirable is generally found in constructing rapid-transit tunnels under city streets. This fact introduces the chief difficulties encountered, since surface traffic makes it necessary to obstruct the streets as little as possible. The two methods of open-cut tunneling commonly practiced may be classed as the longitudinal-trench method and the transverse-trench method. The simplest manner by which to construct open-cut tunnels is to open a single cut or trench the full width of the tunnel masonry. This trench is strutted by means of side struttings of vertical planks held in place by transverse beams extending across the trench and abutting against longitudinal timbers laid against the strutting planks. The lining is built in this trench and then filled around and above with well-rammed earth, after which the surface is restored. Generally the trench is opened in short lengths and each length completed ready for surface traffic before the adjacent length is opened. Another form of longitudinal-trench method is to open two narrow parallel trenches in which are built the side walls. The soil between these walls is then removed to a sufficient depth to permit the roof to be built and covered over, and the final process is to take out the core of earth inclosed by the side walls and roof. Generally one side wall and one-half of the roof arch are completed and covered over before the other side wall and half arch are begun. By this arrangement one-half of the street is always unobstructed.

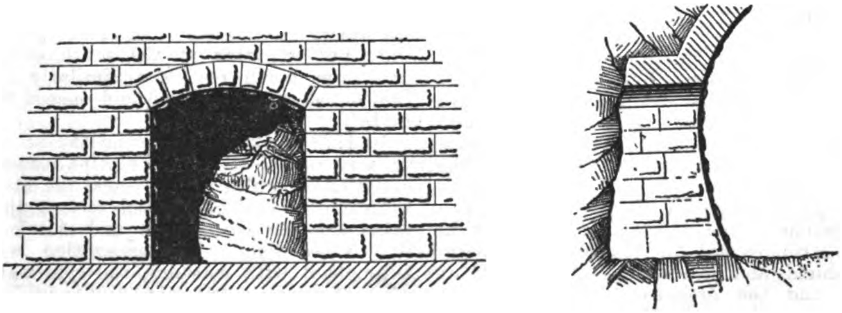


FIG. 11. MASONRY WORK IN TUNNEL.

In the transverse-trench method a trench about 12 feet wide is opened across the street, and in this trench a short length or slice of the subway is built. Owing to the small size of the opening, it is possible to cover it with a timber platform which carries the street traffic during construction. This method was extensively used in constructing the subway at Boston and at New York. In subway construction in American cities in nearly all cases the contractors are required to support the street surface so as not to interfere with traffic while excavating below. This involves elaborate and strong timbering systems.

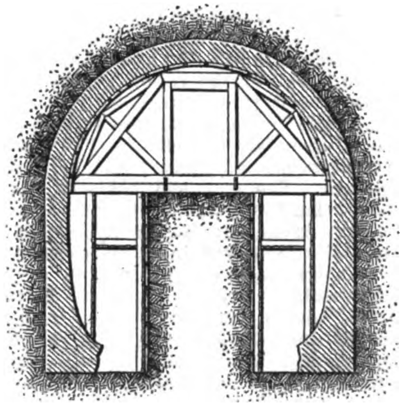


FIG. 10. TYPICAL MASONRY LINING FOR TUNNELS.

Submarine Tunneling. Submarine or subaqueous tunnels are those excavated under the bed of a river or other body of water, generally to provide land communication between opposite shores. Inflowing water, always a serious difficulty in tunnel work everywhere, is here the most serious problem with which the engineer has to deal. Where the tunnel is deep below the stream bed and penetrates a material impervious to water it may be excavated by any of the methods commonly employed in subterranean work. When, however, the opposite conditions exist, resort is had to the use of compressed air or to the shield system, or to a combination of the two. In the compressed-air method the forward end of the tunnel where excavation is progressing is filled with air under sufficient pressure to counterbalance the pressure of the water which seeks to enter. In the shield system the work is carried on by the aid of a rather elaborate mechanical device commonly called a shield. The importance of this invention to the tunnel builder can hardly be overestimated.

The shield devised by Barlow already referred to was greatly improved by J. H. Greathead, and was first used in building the London Tower tunnel begun in 1869. The remarkable success of this work led to the rapid adoption of the shield system for tunnel work in England and America. Briefly described, the modern tunnel shield is a steel-plate cylinder, with its forward edge strengthened and sharpened to form a cutting edge. The rear end extends backward so as to overlap the completed lining of the cast-iron rings. Around its inside hydraulic jacks are attached at frequent intervals so that their piston rods bear against the front edge of the completed lining. By applying power to the jacks their piston rods press with great force against the immovable lining and thrust the cylinder forward into the soft earth. Generally the cylinder has a vertical partition or diaphragm near the front end, which prevents the soft earth from rushing back into it except as it is allowed by opening suitable doors. In operation the cylinder is thrust forward until its sharp cutting edge penetrates the earth a little distance. Workmen then withdraw the earth in small quantities through the openings in the diaphragm. After enough material has been thus withdrawn to leave the front of the shield clear, the shield is again thrust ahead and more earth is removed. As fast as the shield moves ahead the lining is erected under the shelter of its tail end. A constant repetition of these processes completes the tunnel.

Cast iron has been used in the majority of subaqueous tunnels for a lining, on account of its strength for relatively thin sections. Its use saves an unnecessarily large excavation, and it also gives a reaction for the shield jacks, as the structure is permanent as soon as the sections are bolted in place.

Generally when shields are used it is necessary to pump in compressed air, although in some cases compressed air has been used without the shield, and vice versa. The amount of air used and the pressure held varies with the nature of the ground through which the tunnel is driven. The average pressure used is between 25 and 30 pounds per square inch. This pressure is employed when there is from 70 to 100 feet to the top of the water. In many cases it has been necessary to dump clay to a depth of 20 or 30 feet on top of the tunnel.

A method of tunnel construction that has found considerable application in the United States consists in constructing cylindrical steel sections, closing their ends with wooden bulkheads, then floating them into position and sinking them in a trench dredged in the river bottom. The various sections are joined successively and inclosed with concrete as well as given an interior lining of the same material. This system was first used in the Detroit River tunnel of the Michigan Central Railroad between Detroit and Windsor, and then was found available for tunnels under the Harlem River for the New York Subway, and at Chicago and other places. Where dredging can be done, and it is not necessary to go to any considerable depth below the river bottom, this method is distinctly useful.

NOTABLE EUROPEAN TUNNELS

The number of tunnels notable because of their length, the difficulties encountered in their construction or for other reasons, is so great that mention can be made here of only a few of those which are most celebrated. The Mont Cenis Tunnel through the Alps was the first to place France in direct communication with Italy. It passes from a point near Modane, in France, under the Col de Fréjus, about 18 miles west of the actual Mont Cenis, into Italian territory, at a point near Bardonecchia, about 24 miles from Susa. The length of the tunnel between extremities is 7.6016 miles. It is formed with a rising gradient from each end, at the rate of about 1 in 45½ from Modane and 1 in 2000 from Bardonecchia, the summit or meeting of the gradients being halfway through the tunnel. The railway does not enter at the extremities of the tunnel, but joins it by means of special curved sections of tunnel at each end. The total length of tunnel traversed by trains is 7.9806 miles. The tunnel is lined with the exception of about 300 yards on the north side. The side walls are 8 feet, 6 inches thick throughout. The arch to the south side is constructed principally of brick, and to the north side of stone, a brick key being applied throughout. There are side paths of flagstones 20 inches wide.

Work was begun in 1857, and for three years hand labor was used entirely, but it was planned from the beginning by the engineers, Sommeiler, Grandis, and Grattoni, to introduce machinery ultimately. In 1861 power drills were put at work at the south end, and in 1862 the north end was similarly equipped. The tunnel was completed and opened for traffic in 1872.

In 1872 work was begun on the St. Gotthard railway tunnel through the Alps between Italy and France, which far exceeded the Mont Cenis in magnitude. This tunnel crosses the mountains between Goeschenen and Airolo, and is 9.25 miles long. The excavation was lined throughout with masonry, the side walls being of rubble stone and the roof arch of brick. Along the bottom there was a culvert of brickwork. The Mont Cenis Tunnel had been excavated by means of a drift as an advance gallery, but at St. Gotthard the advance gallery was a top centre heading. The tunnel was opened for traffic in 1882.

The third great Alpine tunnel was the Simplon Tunnel, which was opened in 1906. Many schemes for the connection of Italy and Switzerland by a railway near the Simplon Road Pass had been devised. The scheme which was put forward in 1881 by the Jura-Simplon Railway consisted broadly of piercing the Alps between Brigue, in the Rhone valley, and Iselle, on the Italian side, from which village the railway descends to the southern terminus at Domo d'Ossola, a distance of about 11 miles. The tunnel is a double tunnel. That is, there are two parallel tunnels, having their centres 56 feet apart, each carrying one line of railway. By means of cross headings every 220 yards the problems of transport and ventilation are greatly facilitated. In cross section tunnel No. 1 is 13 feet, 7 inches wide at the bottom, and 16 feet, 5 inches wide at the widest part, with a total height of 18 feet above rail level. The material penetrated is rock. The construction was rendered more difficult by the inflows of hot water from springs in the vicinity. The trains are drawn through the tunnel by electric locomotives.

A new or second Simplon tunnel to meet the needs of increased traffic was demanded, and this had progressed to a point where by 1915 the length of completed tunnel at the north and south ends was over half completed, but progress was seriously interfered with by the drafting of workmen for the Italian army.

The third longest tunnel in Europe is the Loetschberg Tunnel, under the Loetschen Pass, on the line from Bern to Brig. This tunnel was begun in 1906, and was opened for international traffic on June 15, 1913. It is 9.04 miles from portal to portal. Another important Swiss tunnel is on the Tauern railway through the Alps at Gastein. It is 27,965 feet in length and was completed in 1909.

At the time of the outbreak of the great war a number of important tunnels were under construction in Europe. In Switzerland the Münster-Grenchenberg Tunnel through the Jura Mountains, 5⅝ miles in length, was pierced through in 1914. In 1915 the Côte d'Or Tunnel, 3¾ miles in length, through the Jura Mountains, on the new direct line of the Paris-Lyons-Mediterranean railway to the Simplon Tunnel route in Italy, was opened to traffic, having been under construction from 1910. This is a double-track tunnel, where it was found possible to use steam locomotives on account of its good ventilation. Considerable tunneling was required in connection with the construction of the Jungfrau railway, where in 1912 the line was completed as far as Jungfraujoch. This tunnel was constructed on a grade to secure the required ascent. In 1916 work was in progress on a tunnel under the Furka Pass, and other schemes were in course of consideration. In Switzerland, on Jan. 1, 1915, there were in operation or under construction 627 tunnels with a total length of 175.01 miles.

AMERICAN TUNNELS

The great European railway tunnels which have been described find their nearest counterpart in America in the Hoosac Tunnel, the Stampede Tunnel, the Cascade Tunnel, the Snoqualmie, and the Rogers Pass Tunnel. The Hoosac Tunnel is on the line of the Fitchburg Railroad in Massachusetts, and passes through a southern extension of the Green Mountains known as the Hoosac Mountains. It is 4¾ miles long, and was driven from the two ends and from an intermediate shaft 1028 feet deep. Work was begun originally in 1855 and was carried on intermittently, there being many long delays due to lack of funds and the obstacles encountered. The tunnel proper was completed in 1873, but several additional years were consumed in the masonry work. Its cost was about $11,000,000. The tunnel is 24 feet wide in the widest part and 22 feet, 8 inches high, and carries two lines of railway track.

The Stampede Tunnel carries the Northern Pacific Railway through the Cascade Mountains, and was begun in 1886. From the time it was determined to make Puget Sound the western terminus of the Northern Pacific Railway the question of a feasible route across the Cascade Range was prominently before the company. Between the years 1873 and 1884 several proposed routes were examined by the company's engineers, of which those via the Natchess, Stampede, and Snoqualmie passes were prominent. The Stampede route, lying between the other two, was finally recommended, and was formally adopted by the company in 1884. The altitude of the mountain beneath which it was necessary to tunnel was 3970 feet above sea level, and the greatest thickness over the top of the tunnel is 1400 feet, the average depth being about 1200 feet. The elevation of the east portal of the tunnel above the sea is 2827 feet, and that of the west portal is 2800 feet. Work was begun in February, 1886. The total length of the tunnel was 9850 feet, with a rising grade from each end towards the middle and the total cost was $1,160,000.

The Cascade Tunnel which carries the Great Northern Railroad through the summit of the Cascade Range in Washington was begun in 1897 and finished in 1900. It is a single-track tunnel, 21.5 feet high, 16 feet wide, and 2.6 miles long.

In 1915 the Snoqualmie Tunnel through the Cascade Mountains between Rockdale and Keschelus, some 60 miles east of Seattle, was completed. This was a single-track tunnel, 11,890 feet in length, the construction of which was estimated at some $2,000,000, but the saving in snow fighting alone was estimated at $175,000 per year, while the new line effected a saving of 443 feet of elevation and 1239° of curvature. It was constructed through varying kinds of rock, with about 75 per cent of the distance through hard slate, and the remainder quartzite and granite.

In 1916 the Rogers Pass Tunnel, the longest tunnel in North America, was nearing completion on the Canadian Pacific Railway at the Rogers Pass summit in the Selkirk Mountains between Glacier and Field, B. C. In this tunnel novel methods of construction were adopted, viz., running a pioneer tunnel from each end parallel with but distinct from the main tunnel, to which cross cuts were run at intervals. This double-track tunnel was able to save 540 feet in elevation, and 5 miles in distance, in addition to eliminating long stretches of snow sheds. The total length of the tunnel was 26,400 feet, and it was built without intermediate shafts. The maximum depth of rock above the tunnel was 5690 feet, and the tunnel was 24 feet high and 29 feet wide, with a concrete lining through the softer materials.

The Mount Royal Tunnel, which gives access for the Canadian Northern Railway into the business section of Montreal, was virtually completed in 1916. It is 3.1 miles long, and leads to a passenger terminal to be located immediately adjacent to its east portal. The tracks at the station are 50 feet below the level of the street, and most of the station proper is underground. The tunnel is built for double track, being 23.5 feet high, 31 feet wide. It is located almost entirely in rock, and centre bottom headings were employed, and as soon as these were pushed forward cars were run so as to remove the muck and broken stone, the latter being crushed for rock material and concrete.

Among the many important railway tunnels which have been built through soft ground only two will be mentioned. The Baltimore Belt Tunnel, 8350 feet long, in Baltimore, Md., was excavated through water-bearing sand, loam, clay, and gravel by the German method of soft-ground tunneling. It provides for a double-track railway line. The St. Clair Tunnel carries the double tracks of the Grand Trunk Railway under the St. Clair River between Michigan and Canada. The excavation consisted of an open cutting on the American side 2500 feet long; a tunnel 6000 feet long under the river, and an open cutting on the Canadian side 3100 feet long. Work was begun by means of two shore shafts in 1888, but these were abandoned, and in 1889 work was commenced on the cuttings. The shields used were 21½ feet outside diameter, and the cylindrical shell consisted of 1-inch steel plates. The cylinder was stiffened by five diaphragms dividing it into 12 cells. As the shield was shoved forward a paste of cement and water was forced out through holes left in the lining to fill the space left between the lining and the clay. The excavation was done in front of the shields, which were then forced forward by hydraulic jacks, and the erection of the permanent cast-iron lining followed up, the ring being erected inside the tail of the shield. The lining is 21 feet in outside diameter. Each ring of lining is 18 inches long, measured on the line of the tunnel, and is made up of 13 segments and a key piece. Each segment weighs 1050 pounds, and the total weight of cast iron in the lining is 27,000 tons.

The Bergen Hill Tunnel of the Erie Railroad which has been in part turned into an open cut is worthy of mention on account of its size rather than its length. The work consisted of four tunnels varying in length from 220 feet to 574 feet. The clear span of the roof was 56 feet and the tunnels carry four standard gauge tracks.

SUBMARINE TUNNELS

Channel Tunnel. The most ambitious scheme of tunneling was the project to connect England and France by a tunnel under the English Channel, which has been discussed periodically, both as an engineering proposition and on account of the political and economic considerations involved. It had been proposed by Hawkshaw and Brunlees about 1870 that such a tunnel could be built, but opposition of a sentimental and military nature developed whenever the project was advanced, until 1913, when companies were organized both in Great Britain and in France, in attempts to secure government sanction for the scheme. It was argued that with the experience with the London tubes and other deep tunnels, and in view of the general development in engineering knowledge and experience there would be no difficulty in the way of constructing two distinct sets of bores, one of which would be a drainage heading which could be used also for the removal of excavated materials and to supplement the main system of ventilation. The main tunnels were to consist of two single-track tubes, each of 18 feet interior diameter, and placed 32 feet apart from centre to centre, being lined throughout with cast-iron segments of ample strength to resist any possible pressure. An estimate of the total cost of the undertaking was made of about $60,000,000, but before the plan, which was advanced seriously, could be discussed, the outbreak of the great war prevented active progress.

The first notable submarine tunnel to be driven through rock is the Severn Tunnel under the river Severn in England. The Great Western Railway system west of Bristol was formerly separated south of Gloucester by the Severn and its estuary, from the lines between Gloucester and the South Wales ports, as well as from the western lines between Hereford and North Wales, Liverpool, Manchester, and the north. This want of connection was only partly remedied by a steam ferry across the estuary of the Severn. A tunnel under the Severn was, accordingly, proposed in 1871 to provide for through traffic, and was authorized in 1872. Work was begun in 1873. The site selected for the tunnel was about 2 miles below the mouth of the Wye, where the width of the estuary at high tide is about 2¼ miles. The strata traversed by the tunnel consist of conglomerate, limestone, carboniferous beds, sandstone, marl, gravel, and sand; the least thickness of soil between the top of the tunnel and the deepest part of the channel is 44¾ feet. The total length of the tunnel is 4 miles, 624 yards. The tunnel was excavated from four shafts, work being commenced in 1873 and completed in 1886. Great difficulty was experienced with water, which flooded the workings on several occasions.

The Mersey Tunnel, about 1 mile long, connects Liverpool and Birkenhead and was built in 1888. In this work a ventilating tunnel of smaller size than the main tunnel was excavated under the main tunnel by a rotary boring machine which cut out the passageway to full size at one operation.

The Pennsylvania Railroad tunnels in and entering New York City consist of a double tunnel from the west side of Bergen Hill in New Jersey to the New City terminal at Thirty-second Street and Ninth Avenue; the station itself; tunnels under the city to the East River; four single-track tubes under the river to Long Island City, where connection is made with the Long Island Railroad and where there are yards for cleaning and making up the trains. Work was begun on the Hudson River tunnels early in 1904, and by October, 1906, accurate connections had been made under the river. The railroad tracks leaving the original line of the Pennsylvania Railroad at Harrison, N. J., enter the twin tunnels, which are spaced 37 feet centre to centre at the west face of Bergen Hill. As this is in rock (a distance of nearly 6000 feet), each tunnel is simply lined with concrete. Near the river, i.e., on the east side of the hill, the tunnels enter the Weehawken shaft, which is 70 feet deep, and which was sunk for the purpose of not only driving west under the hill to meet those coming east, but at the same time driving east under the river to meet those coming west from the opposite shore. About 400 feet east of the Weehawken shaft the tunnels strike soft ground, making tubes of cast iron necessary. These are built up in sections and lined with 22 inches of concrete, reducing the exterior diameter of 23 feet to 19 feet. Under the river where the material is soft, for a distance of nearly 5000 feet, to prevent sinking under heavy traffic it was necessary to support the tubes on iron and concrete piles resting on bed rock. Approaching the terminal at Thirty-first to Thirty-third streets, Seventh to Ninth avenues, the tunnels diverge, forming a small section of 34 feet span double-track tunnel, a section of 1096 feet of triple tunnel containing four tracks and three spans, and a section of 605 feet of four tracks under one span. Within the tubes a ledge 3 feet 8 inches wide on the level of the car windows is formed of concrete, to afford the means of egress in case of accident, to provide a path for workmen, and to carry inside the conduits for light, power, telephone, and telegraphic purposes.

The New York City tunnels were driven from several shafts. One of these located at Eleventh Avenue and Thirty-second Street was for the purpose of driving the tunnels westward under the Hudson and at the same time eastward to the terminal. Two others, one in Thirty-second Street and one in Thirty-third Street, between Madison and Fourth avenues, were for the purpose also of driving east and west under the city, and finally a shaft was located on the East River front at Thirty-third Street to permit of work being carried on both beneath the river eastward and beneath the city westward. As the two single-track tunnels from beneath the Hudson approach the terminal they diverge to make track space, and in a similar manner, running east from the station, they converge until they finally become four single-track tubes beneath the East River. At Seventh Avenue they consist of two three-track tunnels, one under Thirty-second and one under Thirty-third Street, but at the west line of Fifth Avenue the three tracks are reduced to two, and each pair enters a separate excavation divided by a 12-foot wall, and spaced 34 feet centre to centre. At First Avenue they are still further reduced to two pairs of single-track tubes.

The East River tunnels consist of four separate tubes beneath the river identical in every respect with those beneath the Hudson. They were driven by the shield process, and connect New York City with Long Island City. On the Long Island side they were begun in the foot of two shafts located just west of Front Street and run beyond up to East Avenue, about 2000 feet, and from there to Thomson Avenue.

The Hudson tunnels between Manhattan and Jersey City and Hoboken represented the successful culmination of several attempts to construct a tunnel under the Hudson River. For financial and other reasons these had proved unsuccessful until the project was taken up by the Hudson and Manhattan Railroad Company, which was able to build two sets of twin tunnels under the Hudson River—one from Fifteenth Street, Jersey City, to Morton Street, Manhattan, and thence northerly to Sixth Avenue and Thirty-third Street, and the other between the Hudson Terminal Building at Cortland and Fulton streets, Manhattan, to Jersey City, and thence westerly about ¾ mile to Brunswick Street, where the tunnel comes to the surface. These tunnels were constructed through the soft ground of the river bed by using shields, and the upper line was opened for traffic Feb. 1, 1908, while the second pair of tubes were opened for regular train service on July 19. The form of construction is segmented cast steel bolted together in the rear of the excavating shields as the latter were advanced. The lower half of each tube is lined with concrete, and the tunnels have a clear diameter of 15 feet.

WATER TUNNELS

Next to their use for railways, tunnels are more frequently built to conduct water than for any other purpose, perhaps. (See AQUEDUCT.) A good example of rock tunneling for this purpose is afforded by the Niagara Tunnel, built to carry the water away from the wheel pit of the Niagara Power Company at Niagara Falls, N. Y. This tunnel is 7600 feet long, 19 feet wide, and 21 feet high, and runs through solid limestone rock. In California the Mount Shasta Power Corporation has a 7-mile tunnel to carry water from Pitt River to its power house. This tunnel at first was of 7 × 9 section and subsequently was to be enlarged. The Chicago water-works tunnels, through which the city of Chicago draws its water supply from Lake Michigan, constitute the most elaborate system of water-supply tunnels anywhere in the world. They extend out into the lake as well as under the city, and vary in diameter from 5 to 13 feet. In 1915 there was under construction an addition to this elaborate system, which addition consisted of a 7-mile tunnel extending from a pumping station 4 miles under the city and 3 miles under the lake to an intake crib. This tunnel is of horseshoe section, 13 feet wide and 12 feet high, and is driven through solid rock for the entire distance.

At Milwaukee, Wis., there is a water-supply tunnel 3200 feet long and 7½ feet in diameter, lined with brick masonry throughout, completed in 1895. At Cleveland, Ohio, there is a water-supply tunnel extending out into Lake Erie that is 26,000 feet long and 9 feet in diameter, and two other older tunnels, one being 5 feet in diameter for 6662 feet and 5½ and 6 feet in diameter for 2580 feet, and the other being 7 feet in diameter and 9200 feet long. Recently the West Side intake was extended 16,000 feet beyond a crib 1⅛ miles from shore. For many years one of the most notable water-supply tunnels in the world was the Croton Aqueduct, which brings water to New York City. This tunnel is 33 miles long and about 14 feet high and 14 feet wide; it was built through rock. This in turn has been surpassed by the new Catskill Aqueduct. The Los Angeles Aqueduct includes some 43 miles of concrete lined tunnels. (See AQUEDUCT.) With the increased demand for water supplies for power and irrigation, tunnels are constantly being constructed by the United States Reclamation Service and similar agencies, of which the Gunnison Tunnel, 30,582 feet in length, is a good example. (See IRRIGATION.) The Wyrnwy Aqueduct, 77 miles long, for bringing water to the city of Liverpool, England, has three tunnels, but not comparable in length with those mentioned.

RAPID-TRANSIT TUBES AND SUBWAYS

Within recent years many important tunnels have been constructed to carry rapid transit railways under city streets. Some of these, like the London tunnels, have been deep tunnels; but others, like those of Boston, Paris, Philadelphia, and New York, have been constructed for the most part by open-cut methods at a small depth below the surface. The City and South London Railway, in London, was begun in 1886 and completed in 1890, is 3⅛ miles long from the city to the Swan at Stockwell, and is entirely underground. Briefly the road consists of two 10 feet, 6 inch cast-iron lined tunnels substantially parallel to each other, which converge into a single tunnel at the termini to permit the transfer of trains from one line to the other. These tunnels were constructed by means of the shield system. The Waterloo and City Railway in London extends from the Waterloo station of the Southwestern Railway to the Mansion House, a distance of 1 mile, 5 furlongs, and 150 yards. It consists of two parallel circular tunnels 12 feet, 1¾ inches interior diameter except at the curves, where the dimension is increased to 12 feet, 9 inches. The tunnels were driven by the shield method, work having been begun in 1894 and completed in 1897. A single electric railway track in each tunnel forms a double-track railway between the termini named. The Central London Railway runs from Shepherds Bush to the Bank, a distance of 5¾ miles, the whole distance being in deep tunnel at depths varying from 60 to 90 feet. It consists, like the two roads previously mentioned, of two parallel circular tunnels. Each tunnel is 11½ feet in diameter and has a cast-iron lining. The shield system of construction was employed. To be added to these tunnels are the Metropolitan District railways, parts of which are underground, begun in 1853, the Waterloo and Baker Street Railway.

The Blackwall Tunnel for street traffic under the river Thames at London is 6200 feet in length, of which 3088 feet are tunnel proper, 1370 feet are open cut roofed over, and 1742 feet are open cut without covering. The exterior diameter of the tunnel is 27 feet. It was driven by means of a shield 27 feet, 9 inches in diameter and 18½ feet long, with two diaphragms, from horizontal partitions or stages and four vertical partitions. The lining is of cast-iron rings. Work was begun in 1892 and completed in 1897. The tunnel provides a roadway 16 feet wide and two sidewalks each 3 feet, 1½ inches wide. The Rotherhithe Tunnel, completed in 1908 under the Thames, connects Ratcliff on the north shore with Rotherhithe on the south. It has a total length of 6883 feet, of which 3698 feet are in cast-iron tunnel and 3194 feet in cut and cover or open approach. It has an internal diameter of 27 feet. In Glasgow, Scotland, the Glasgow City and District Railway has a length of 3.123 miles. Of this distance 1 mile is deep tunnel, and 3483 feet are tunnel built by the open-cut method. Work was begun in 1883 and completed in 1886. The Glasgow Central Railway has 0.84 of a mile of deep tunnel and 3.13 miles of open-cut tunnel. The Glasgow District Subway, 6½ miles long, consists of two parallel circular cast-iron lined tunnels 11 feet in interior diameter. The tunnels were driven by the shield method. Construction was begun in 1891 and completed in 1894. The subways of Paris were built and are owned by the city and are leased, equipped, and operated by a private company. The metropolitan system (Paris subways) as originally planned included only about 46.6 miles of double track. The first line was opened in 1900. Later extensions provided for 34.1 miles additional. The entire system, including connections, will have 82.9 miles of double track, of which 73.3 will be used for the transportation of passengers and the remaining mileage for terminals and connections. The track is standard gauge, but the tunnel opening is too small to admit steam-railway equipment. The subway equipment can therefore run out on to the steam lines, but the steam-line trams cannot use the subway.

The first Boston Subway, begun in 1894, is an underground tunnel for the surface electric lines entering the business district of the city of Boston. The portion of the line completed in 1898 was 10,810 feet long, divided between double-track and four-track tunnel. The bulk of the tunnel was built by open-cut methods, but on certain portions the shield system was employed. In 1900 work was begun on a 1¼ mile extension of the original line under Boston harbor to East Boston. The East Boston Tunnel has a polycentric cross section 23½ feet wide and 20½ feet high, and is lined with concrete masonry. The double-track subway section is approximately rectangular and 24 feet wide by 14 feet high, while the four-track section is a similar form, but twice as wide. The lining consists of concrete side walls and brick roof arches supported by columns and I-beams of steel. These tunnels were followed in 1908 by the Washington Street Tunnel, some 2 miles in length and used by the elevated railway trains. In 1912 there was completed a subway to Cambridge which involved a tunnel 2500 feet in length under Beacon Hill. The Boylston Street Subway, 1½ miles long, was begun in 1912 and completed in 1914. The Dorchester Tunnel, which will be about 12,000 feet long, was begun in 1912, and in 1915 there were 2108 feet completed.

The original New York Subway, as contracted for in 1899, comprises some 20½ miles of line, three-fourths of which is in tunnel. A four-track line runs from the City Hall to 96th Street, above which it divides, one branch running to Bronx Park and the other to Van Cortlandt Park. The cross section of the underground line is of different types. In the rectangular section, used for more than half of the line, the dimensions adopted for two tracks are 25 × 13 feet, and for four tracks, 50 × 13 feet. The barrel-vault section, composed of a polycentric arch, is usually 24 feet wide and 16 feet high. The circular sections are 15 feet in diameter, two tunnels being built side by side for double-track line. The work was done partly by open-cut methods and partly underground, according to the depth of the line below the surface.

The new New York Dual Subway, begun in 1913, will increase the single-track mileage of the dual system (subways and elevated roads in Manhattan and Brooklyn) to 620. The new subway will contain about 3,000,000,000 cubic yards of concrete and cost in the neighborhood of $337,000,000. It includes many types of construction, including open cut, excavation under decking, and subaqueous tunnels driven with and without the use of compressed air. The work also involves the underpinning of buildings, some of them 20 stories high. See URBAN TRANSPORTATION.

In 1916 eight tunnels, seven of them double-tube, were in actual use or building, to connect Long Island with the west bank of the East River at New York City. The tunnels were original subway tubes, the Whitehall-Montague Street tunnels, the Old Slip-Clark Street tunnels, the Fourteenth Street-Eastern tunnels, of the new dual system, the Pennsylvania tunnels, the Queensboro or Steinway tunnels, the Sixteenth Street tunnels, and the Consolidated Gas Company's Astoria tunnel. Naturally such work was well understood, and construction progressed rapidly and for the most part without incident. Philadelphia opened its subway system in 1908 with a two-track tunnel in connection with its elevated railways. Mention should be made of the system of narrow-gauge tunnels in Chicago for handling freight, built in 1901. Other American and European cities were engaged in developing subway or tunnel schemes, but they indicated little departure from the general systems outlined.

OTHER NOTABLE TUNNELS

Among other notable tunnels the following may be briefly mentioned: Arlberg Tunnel, in Austria, begun in 1880 and completed in 1884 for a double-track railway, 6.38 miles long. Tequixquiac Tunnel, begun in 1888 to drain the valley of Mexico, 6 miles long and about 14 feet wide and 14 feet high, completed in 1898. Trans-Andean Railway Tunnel, through the summit of the Andes on the railway line between Buenos Aires and Santiago, 3 miles long, at an elevation of 10,460 feet above the sea. First Thames Tunnel at London, England, begun in 1825 and completed in 1843, 1200 feet long with two parallel ways of horseshoe section, each 13¾ feet wide and 16⅛ feet high. East River Gas Tunnel, between New York and Brooklyn, 2516 feet long and 10 feet, 2 inches in diameter, begun in 1892 and completed in 1894. East River Tunnel of Consolidated Gas Company, New York to Astoria, 4662 feet in length, of sufficient size to accommodate four 72-inch gas mains. Khojak Tunnel, on the Northwestern State Railway in India, 12,870 feet long, begun in 1889 and completed in 1891. Parsik Hill Tunnel, the second longest in India, 3900 feet in length. Graveholz Tunnel, on the Bergen Railway, in Norway, single track, 17,400 feet long. Arthurs Pass Tunnel, through the Southern Alps range on the line of the New Zealand government railway in South Island, 5 miles, 1660 feet in length, begun in 1908. The Otira Tunnel, also in New Zealand, is notable for length, being 5½ miles in length.

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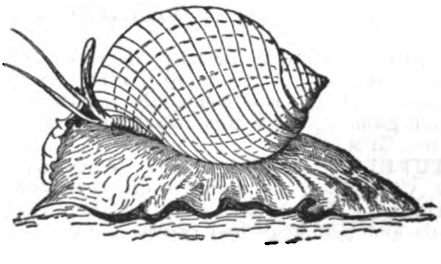
TUNNEL NET. See DECOY.

TUNNY (from OF. *ton*, *thon*, Fr. *thon*, from Lat. *thunnus*, *thynnus*, from Gk. *θύννος*, *thynnos*, *θῦνος*, *thynos*, tunny, from *θύνειν*, *thynein*, to dart along), or HORSE MACKEREL. The largest species of mackerel (*Thunnus thynnus*), also called tuna and great albacore. It has the typical form of mackerel (q.v.), except that its body is thicker, and the tail is widely forked, becoming crescent-shaped. It is pelagic, and occurs in all the warm seas, attaining a length of 10 feet and a weight of 1500 pounds. The flesh, even of large specimens, is good, and in southern Europe there are important fisheries. Tunny fisheries were early established by the Phœnicians, and salted tunny was esteemed by the Romans. The fish are captured by nets, and, besides the large sale of them fresh, vast numbers are disposed of by canning. Every part of the body is utilized, the parts being packed and sold separately, especially in Italy, under distinctive names. A closely related species is the long-finned albacore (*Germo alalunga*), common in the Mediterranean and widely distributed elsewhere, and abundant in the spawning season on the southern coast of California. It is about 3 feet long, and very handsome, but its flesh is poor. See Plate of MACKERELS.

TUN SHELL. One of the large, thin, globose, finely ribbed shells of the gastropod mollusks of the family Doliidæ, closely related to the helmet shells and cowries (qq.v.). They are mainly tropical, but a well-known one (*Dolium galea*) inhabits the Mediterranean, and becomes 10 inches in length, making it the largest mollusk of that region. The fig shells (q.v.) also belong to this family.



TUN SHELL.

TUN'STALL. A modern manufacturing and market town in Staffordshire, England (Map: England, D 3). Since 1910 it has formed part of Stoke-on-Trent (q.v.).

TUNSTALL or **TONSTALL,** Cuthbert (1474–1559). An English bishop and author. He was born at Hackforth, Yorkshire; was educated at Oxford and Cambridge, and studied at Padua; became rector of Harrow-on-the-Hill, 1511; Archdeacon of Chester, 1515; and was appointed Master of the Rolls in 1516, after his return as Commissioner to Brussels, where he made the acquaintance of Erasmus and negotiated two treaties with Charles I of Spain, afterward Charles V. He was appointed dean of Salisbury, 1521, Bishop of London in 1522, Lord Privy Seal in 1523, Ambassador to Spain in 1525, and to France in 1527, and became Bishop of Durham in 1530. He was deprived of his bishopric in 1552, and committed to the Tower on a charge of treason; was reinstated by Mary, but, declining the oath of supremacy to Elizabeth, was again deprived in 1559, shortly before his death. He was considered one of the ripest scholars and wisest diplomats of his period, and was the author of various theological and educational works, including *In Laudem Matrimonii, Oratio* (1518); *De Arte Supputandi Libri Quatuor* (1522), an arithmetical treatise frequently republished (1522); and *De Veritate Corporis et Sanguinis Domini nostri Jesu Christi in Eucharistia* (1551), one of the best contemporary statements of the doctrine of the Eucharist.

TUPAC AMARU (tōō′pȧk ä′mȧ-rōō) **II** (1742–1781). A Peruvian revolutionist, whose real name was José Gabriel Condorcanqui, born at Tinta (south of Cuzco). He was a direct descendant of the original Incas and has been called the last of the Incas, though it seems he did not himself lay claim to that title. Under the Spaniards he ruled several villages, and in 1780, failing to get better treatment for the Indians, he organized an uprising of 60,000 natives. The insurgents soon controlled all the country between Lake Titicaca and Cuzco, but in 1781 Tupac was defeated and captured and, with some of his family, was executed with frightful torture. It has been estimated that 80,000 Indians were killed, the Spaniards' object apparently being to exterminate the Inca race. Fernando, Tupac's son, was condemned to life imprisonment, and sent to Spain when a child 10 years old. His fate is not known, although in 1828, a man calling himself Fernando Tupac Amaru was pensioned at Buenos Aires, and afterward was a monk at Lima.

TUPAIA, tū̇-pä′yȧ, or **BANXRING.** See Tree Shrew.

TUPELO, tū′pė-lō (North American Indian name), *Nyssa.* A genus of North American trees, including those commonly known as the cotton gum, Ogeechee lime, black gum, etc. See Black Gum.

TUPELO. A city and the county seat of Lee Co., Miss., 50 miles south by west of Corinth, on the Mobile and Ohio and the St. Louis and San Francisco railroads (Map: Mississippi, H 2). Noteworthy features are the United States Fish Hatchery, Tupelo Military Institute, courthouse, city hall, and the public parks. There are cotton and cottonseed-oil mills, a fertilizer factory, compress, brick and tile works, etc. Pop., 1900, 2118; 1910, 3881.

TUPÍ, tōō-pē′ (allies, or village), or Tupinamba. An ancient tribe from which the widespread Tupían stock (q.v.) takes its name, and whose language is the basis of the lingoa geral or Indian trade language of the Amazon region. About 1550 they were populous and powerful. Being broken and driven back by the whites, they went into the interior, the bands taking different names. In 1640 some of them were still settled, under their own name, along the Lower Amazon. Their religion was a simple animism, with little ceremonial. Those yet remaining in the same vicinity are now called, improperly, Tapuya (q.v.). They are civilized, quiet, and intelligent. The men are strong, and supply the bulk of the crews for the Amazon River trade.

TUPÍAN (tōō-pē′*a*n) **STOCK,** or Tupí-Guarana. The most widespread and important linguistic stock of South America. When the Portuguese took possession of Brazil the Tupían tribes held the greater portion of the territory from the Río de la Plata (Paraguay or Paraná) on the south to the Amazon on the north, and extended far inland. The two principal tribes were the Tupí (q.v.), about the mouth of the Amazon, and the Guaraní (q.v.), on the Lower Paraguay. Of numerous other cognate tribes, the most important were the Chiriguano, Guarayo, Múndurucú (q.v.), Mura (q.v.), and Omagua (q.v.). Many of the eastern tribes were gathered into missions by the Jesuits at an early period, the Guaraní missions in particular at one time containing more than 300,000 Indians; but through slave-hunting raids and the subsequent expulsion of the Jesuits the missions were broken up, the more civilized Indians remaining to be incorporated with the Spanish settlements, while others retired into the unexplored western wilderness. In general culture the Tupían tribes as a rule were superior to other aborigines of Brazil, though much inferior to the Quichua of Peru. They practiced agriculture to some extent, raising corn, manioc, and tobacco, and were expert stone workers, hammock weavers, and makers of pottery. They kept monkeys and peccaries for food, but their main dependence was upon hunting and fishing. Their houses were light structures, usually communal, and most of them went naked. With the exception of the Omagua, who had acquired considerable of the Quichua culture, they had no metals. The Tupían languages have been extensively cultivated, the Guaraní having been adopted by the Jesuits for use in all the missions of the Paraguay, while the Tupí, in its corrupted form, is still the trade medium throughout the Amazon region. Consult: Lucien Adam, *Matériaux pour servir à l'établissement d'une grammaire comparée des dialectes de la famille Tupí* (Paris, 1896); D. G. Brinton, *Linguistic Cartography of the Chaco Region* (Philadelphia, 1898); Hermann von Ihering, *The Anthropology of the State of S. Paulo, Brazil* (2d ed., S. Paulo, 1906); F. Pierini in *Anthropos,* vol. iii (Salzburg, 1908).

TUPPER, Sir Charles (1821–1915). A Canadian statesman. He was born at Amherst, Nova Scotia, and graduated in medicine at Edinburgh University in 1843. For 12 years he practiced his profession in his native county of Cumberland, which in 1855 elected him as a Conservative member of the Legislative Assembly. He was Provincial Secretary in 1856 and Premier in 1864–67. He strongly supported the movement for Canadian Confederation, overcame the opposition of Joseph Howe (q.v.), attended the conferences in 1864 at Charlottetown and Quebec as a delegate, later joined the conference of delegates with the British government in London, and shared in the accomplishment of Confederation in 1867. In the first Dominion administration of Sir John A. Macdonald (1867–73) he was successively President of the Council (1870), Minister of Inland Revenue (1872), and Minister of Customs (1873), but resigned the last office the same year, after the defeat of Macdonald on charges of political corruption in connection with contracts for the proposed Canadian Pacific Railway. During five years of opposition he was Macdonald's chief aid and political adviser and had a prominent part in the electoral campaign which resulted in the Conservative victory of 1878 and the establishment of the national policy of a protective tariff the following year. As the first Canadian Minister of Railways, he aided importantly in the construction of the Canadian Pacific by a private company until 1884, when he was appointed High Commissioner for Canada in London. Returning in 1887, he was Minister of Finance until May, 1888, shortly afterward resuming his position as High Commissioner, in which office he remained until 1896. The death of Sir John A. Macdonald in 1891 having been followed by five years of brief ministries and Conservative ineptitude, Tupper was again brought from London to Ottawa, succeeded Sir Mackenzie Bowell as Premier in 1896, and made strong though unsuccessful efforts to extricate the Conservative government from the difficulties into which it had fallen over the educational question (see CANADA, *History;* MANITOBA, *History;* GREENWAY, THOMAS). After his defeat in 1896 he was Conservative opposition leader until 1900, when he retired from public life. He afterward resided in England. Both in Nova Scotia before Confederation and afterward in federal affairs he procured the enactment of many important laws. Imperial federation had his ardent support. He was a man of great physical force and political courage, distinguished both as debater and orator. He was made K.C.M.G. in 1879, G.C.M.G. in 1886, a Baronet in 1888, and a member of the Imperial Privy Council in 1908. He died in England, but was buried at Halifax. His *Recollections of Sixty Years* has much historical value (Toronto, 1914). Consult also Charles Thibault, *The Biography of Sir Charles Tupper* (Montreal, 1884), and E. M. Saunders, *Three Premiers of Nova Scotia* (Toronto, 1909).

TUPPER, SIR CHARLES HIBBERT (1855–). A Canadian statesman, son of Sir Charles Tupper. He was born at Amherst, Nova Scotia, studied at McGill and Harvard universities, and in 1878 was admitted to the bar. In 1882 he was returned as a Conservative to the Dominion Parliament, and subsequently also in 1887, 1888, 1891, and 1896–1900. In 1888–95 he was Minister of Marine and Fisheries, and in 1895–96 Minister of Justice and Attorney-General. In 1893 he served as agent for the British government in the Paris tribunal of arbitration on the Bering Sea question. (See BERING SEA CONTROVERSY.) After 1897 he practiced law at Vancouver, B. C. In 1904 he retired from political life. He was knighted (K.C.M.G.) in 1893.

TUPPER, MARTIN FARQUHAR (1810–89). An English versifier, born in London. His father, Martin Tupper, was a well-known London surgeon belonging to a German family which had long been settled in Guernsey. Martin was educated at the Charterhouse, and at Christ Church, Oxford. In 1832 he entered Lincoln's Inn, where he was called to the bar three years later. He never practiced law, but turned at once to literature. He visited the United States in 1851 and 1876. He died at Albury, near Guildford, Nov. 29, 1889. Tupper published 39 volumes. His first work, poems called *Sacra Poesis* (1832), attracted slight attention. *Geraldine* was published in 1838; it was a ludicrous attempt to complete Coleridge's *Christabel.* In 1838 also appeared the first installment of *Proverbial Philosophy.* The work was completed in 1876. The earlier parts were enormously popular. Large sections of the poems were translated into German, French, and Danish. It is hard to account for this vogue, as the poem is an endless chain of canting moral commonplaces. Consult the autobiography, *My Life as an Author* (London, 1886), and reviews in contemporary periodicals, especially *Fraser's Magazine* (ib., October, 1852).

TUPPER LAKE. A village in Franklin Co., N. Y., 108 miles northeast of Utica, on the New York Central Railroad (Map: New York, F 2). Lumbering is carried on and among the chief industrial establishments are saw mills and a cooperage. Pop., 1910, 3067.

TUR. See GOAT.

TURA, COSIMO (c.1430–95). An Italian painter of the early Renaissance, the founder and most important master of the Ferrarese School. He was born in Ferrara, studied at Squarcione's school in Padua, and was influenced by Donatello and the early works of Mantegna. His powerful, realistic figures are hard in color, but well drawn and modeled. He delighted in the symbolic and the grotesque. His most important paintings include the impressive "Pietà" (Museo Civico, Venice); the "Annunciation" in the cathedral at Ferrara; a "Dead Christ Upheld by Angels" (Vienna); "Christ on the Cross" (Brera, Milan); and the altarpiece "Madonna with Saints" (Berlin Museum). Panels of saints are at Dresden, London, in the Uffizi (Florence), and at Modena and Paris.

TURACO, to͞o-rä'kō (African name). A bird of the African family Musophagidæ or plantain-eaters (q.v.). The species are numerous, of large size and brilliant plumage, and have strong, thick bills, more or less curved on the top, the cutting edges jagged or finely serrated, so as to render them very efficient instruments for cutting soft vegetable substances, on which they feed. The colors are chiefly bright green, greenish-blue, crimson, and yellow; red and green predominate. These birds have a helmet-like crest, which they elevate when excited. One of the largest species is the giant turaco (*Corythæola cristata*) of western and Central Africa, which is 28 inches long. It is blue-green without red, but the tail has a broad, black, subterminal bar, and the bill is red and yellow.

TURA'NIAN. A term formerly applied loosely to all Asiatic peoples, excepting those of Indo-Germanic or Semitic stock. In the early Iranian chronicles of the Persian era the term Turan, in contrast with Iran (the home of the Aryan Iranians), was given to the region to the northeast, including modern Turkestan, the home of non-Aryan, nomadic, uncivilized peoples. The theory once put forth according to which, in prehistoric times, western Asia and most of Europe were peopled by Turanians, whose descendants could be seen in Pelasgians, Hittites, Etruscans, Iberians, Basques, Picts, Finns, and Lapps, has now no currency among the best authorities. The term Turanian still has, however, some scientific currency, although in a much modified sense. Thus De Morgan styles the peoples of the Caucasus Turanians, and Deniker uses the word as synonymous with Turko-Tatars. In linguistics Turanian formerly had some vogue as a term proposed by Max Müller for all languages of Europe, Asia (excepting China), and Oceania, which are neither Indo-Germanic nor Semitic. The division of these languages into Ural-Altaic or Finno-Ugric, Dravidian, Kolarian, Tibeto-Burman, Khasi, Tai, Mon-Anam, and Malayo-Polynesian is now adopted.

TURATI, tōō-rä'tē, FILIPPO (1857–). An Italian Socialist leader, born at Canzo (Como). He graduated in law at the University of Bologna in 1877, and was appointed counselor from the Province of Milan. Later he was elected from Milan as a member of the Chamber of Deputies. From 1891 to 1903 he served as manager and editor of the *Critica sociale*, the monthly organ of the Socialist party. As the chief spokesman of the Reformists or Constitutionalists, Turati became the leader of the Italian Socialists, but in 1904 Enrico Ferri (q.v.) succeeded in supplanting him temporarily. The Milan Congress, however, in 1910 indorsed Turati's Reformist policy by a vote of two to one, and he continued to lead the more numerous section of the Socialists. A close personal friend of King Victor Emanuel III, he was frequently consulted by him before the entrance of Italy into the European War in 1915.

TURBAN SHELL. An herbivorous scutibranchiate mollusk, closely allied in habits and structure to the top shell (q.v.). It takes its name from a resemblance in the shell to an Oriental turban. When denuded of its outer coating the shell is richly pearly, and is one of the shells most widely sold as an ornament. In the Orient, where most of the species live, the animals are often eaten. The aperture is large and flaring, and the operculum calcareous. The typical genus *Turbo*, the genus *Phasianella* (see PHEASANT SHELL), and the spiny genus *Delphinula*, constitute the family Turbinidæ, which may be traced back to Ordovician time, and especially flourished during the Silurian period.

A TYPICAL TURBAN (*Turbo argyrostomus*).

TUR'BELLA'RIA (Neo-Lat. nom. pl., from Lat. *turba*, disturbance, crowd; referring to the whirlpools caused by the movements of their cilia). The first and most highly organized of the three classes of flatworms, composed of free-living worms. The body epithelium is densely ciliated. The turbellarian worms are found in both salt and fresh water in the warmer parts of the world, and in moist places on land in the tropics. They are usually of small size, less than 2 inches long, but some species are 4 or 5 inches long. The body is generally very flat and leaflike, but in some species, especially among the land forms, is narrow, elongated, and slightly arched. The colors are sometimes dull, but many of the marine forms are brightly colored, and are very beautiful objects. Most of the Turbellaria are carnivorous, and are very active, especially in swimming. The class is divisible into three orders, based chiefly on the arrangement of the intestine.

TUR'BERVILLE or **TUBERVILE,** GEORGE (c.1540–c.1610). An English poet of an ancient Dorset family. He was born at Whitchurch, in Dorsetshire, and was educated at Winchester and at New College, Oxford, of which he became a fellow in 1561. Leaving Oxford the next year without a degree, he studied law at one of the inns of court in London. In 1568 he accompanied Thomas Randolph, a special ambassador of the Queen, to Russia, where he wrote verses describing the manners of the people (reprinted in part in Hakluyt's *Voyages*, 1589). Of his later life nothing is known. He probably died about 1610. Turberville occupies an interesting place in English literature as a translator from the Latin and the Italian and as one of the first among English poets to employ the ottava rima (q.v.) and blank verse (q.v.). Chief among his works are *Epitaphs, Epigrams, Songs, and Sonnets* (1567, in Chalmers's *British Poets*, vol. ii, London, 1810); *The Booke of Faulconrie, or Hawking*, with which is bound *The Noble Art of Venerie, or Hunting*, ascribed to Turberville (1575; enlarged 1611); *Tragical Tales* from the Italian, with original epitaphs and sonnets (1587; reprinted, Edinburgh, 1837); and *The Heroycall Epistles of Ovidius in English* (1567). To Turberville have been doubtfully ascribed two versions of Tasso's *Jerusalem Delivered* (manuscript in Bodleian Library at Oxford). Selections from Turberville's poems are in *Early English Poetry*, edited by H. M. Fitzgibbon (London, 1887).

TUR'BINE. A term used to distinguish a variety of steam engines, water wheels, and centrifugal pumps. The general distinguishing characteristics of turbine machinery, compared with older apparatus, is the employment of uniform rotary motion in place of reciprocating, and the use (in one form or another) of impeller and guide vanes instead of pistons and ports. Some steam turbine engines replace the initial guide vanes with nozzles in which the steam is expanded before discharge upon the first impeller vanes. Turbine pumps are commonly distinguished from ordinary centrifugals by the presence of guide vanes which receive the water from the impeller and change its velocity head into pressure more efficiently than does the simple open casing. See PUMPS AND PUMPING MACHINERY; SHIPBUILDING, *Machinery;* STEAM TURBINE; WATER WHEEL AND TURBINES.

TUR'BIT. A fancy breed of domestic pigeons, varying in colors and crest, with a flattened head, very small beak, ruffled breast, and other oddities. See Colored Plate of PIGEONS.

TUR'BOT (OF. *turbot*, from Lat. *turbo*, top). The most valuable of the flatfishes (*Rhombus maximus*), and one of the most toothsome of all fishes. It abounds off the northern coast of Europe, and attains a large size, sometimes 70 to 90 pounds in weight. Its form is shorter, broader, and deeper than that of almost any other flatfish. It is brown in color on the upper surface, which is studded with hard roundish tubercles. Like the other flatfishes, it generally keeps close to the bottom of the sea; and is found chiefly on banks where there is a considerable depth of water. See Flatfish; and Plate of Flatfish and Flounders.

TURCARET, tụr'kȧ'rā'. A comedy by Lesage (1709), satirizing financial corruption.

TURCO-ITALIAN WAR. With the realization of national unity in 1871, Italy entered the field of world politics. Emulating other Great Powers of Europe, the country strove for colonial possessions. Northern Africa appeared to be a possible place for Italy to satisfy territorial ambition. The decline of Turkish control there had already tempted the European Powers to extend "spheres of influence" over these semicivilized territories. France had a foothold in Algeria and Great Britain in Egypt. Italy at first hoped to bring Tunis under her control, but the French had gradually penetrated this territory and in 1881 France proclaimed a protectorate over Tunis. Italian resentment at this action led Italy to join the Triple Alliance (q.v.) with Germany and Austria. Frustrated in ambitions as to Tunis, Italy turned attention to the Turkish territory further east in Tripoli and Cyrenaica. Italian colonists began to settle there and Italian capitalists began "peaceful" penetration of the country. Friction developed between the European financial interests and the weak and corrupt Turkish administration.

After the Turkish revolution of 1908 (see Turkey), which was characterized by an outburst of Turkish nationalism, the Young Turk party opposed the pretensions of Italy in Tripoli. The Italians, on the other hand, declared that their merchants and citizens in Tripoli were being mistreated by the Turkish authorities. The crisis was reached when, in September, 1911, Italy sent an ultimatum to Turkey enumerating her complaints against Turkish misgovernment, informing the Sultan that Italy had determined upon the military occupation of Tripoli and demanding acquiescence within a period of twenty-four hours. The Porte's reply was considered unsatisfactory by Italy, and on Sept. 29, 1911, the Italian government declared war on Turkey.

Italy's action caused great apprehension in the chancelleries of the Great European Powers. Any disturbance in the Turkish dominions was liable to precipitate trouble in the Balkans and might lead to serious and unforeseen consequences. Germany and Austria-Hungary were especially concerned. Turkey had come to be regarded as a member of the Triple Alliance group. Both the German and Austrian governments appealed to Italy, as a member of the alliance, to compromise the issue. They could hardly do more, for if pressure was brought to bear upon Italy it might readily lead her to join forces with the rival diplomatic group (the Triple Entente). Under these circumstances Germany and Austria-Hungary were forced to stand by and see their protégé despoiled by their ally Italy.

Naval and Military Operations. The war opened with the sinking of three Turkish torpedo boats off the coast of Epirus by an Italian squadron. In October, 1911, the Italian fleet blockaded the Tripolitan coast and, after a bombardment, the port of Tripoli was occupied. An expeditionary force was landed but no serious resistance was offered by the Turks, who withdrew into the interior. An uprising of the Arabs led to vigorous reprisals on the part of the Italian authorities. All Arabs who were found with firearms were condemned to death and several thousand others, accused of treachery, were transported to Italian islands. The Italian forces took possession of many coast towns and on Nov. 5, 1911, Italy formally proclaimed annexation of Tripoli and Cyrenaica. Little effort was made, however, to push into the interior.

After the war had continued several months the European Powers tried to bring about peace. Russia, in particular, tried to obtain an agreement among the Great Powers to prepare some feasible means of intervention, but the mutual jealousy and suspicion prevented any concerted action. It appeared as though Turkey might stand out indefinitely. To surrender a large Mussulman population to a Christian Power would have weakened the influence of the Young Turk party in control at Constantinople. Moreover, Italy's hands were tied in that she had bound herself, under pressure from Austria-Hungary, not to carry on military operations in the Balkans or the Ægean Sea. After four months of indecisive warfare Italy made an effort to force matters to a final issue by sending a squadron into the Red Sea and bombarding the port of Hodeida. This was followed by the sinking of two Turkish war vessels in the port of Beirut. The extension of the war to the Turkish Asiatic dominions was regarded by the European Powers with apprehension. It was probably the intention of Italy, by this move, to force the European Powers to bring pressure to bear upon Turkey to yield to the Italian demands. Diplomatic representations were made by the Powers to Turkey, and in the hope of making these effective an Italian squadron appeared in the Dardanelles and bombarded the Turkish forts there.

The Porte replied to the communication from the Powers in regard to mediation that this could only be accepted on the condition that the sovereign rights of Turkey should be maintained and that Tripoli should be evacuated by the Italians. In answer to the Italian attack on the Dardanelles, the Turkish government closed the Straits to commerce, but upon the energetic protest of the Powers, especially Russia, this action was revoked. Further action by the Powers against Turkey was not deemed expedient and it appeared as though the war had resolved itself into a stalemate. In Italy the situation was critical. The government could not revoke its decree annexing Tripoli without compromising Italy's position among the Powers of Europe. The expenses of the war aggravated the financial stringency in the country, and it was essential to bring the war to a close as speedily as possible. As a further effort to influence Turkey, and possibly also the European Powers, the Italians seized twelve of the Turkish islands in the Ægean. This action aroused serious concern, especially in Great Britain, for if Italy retained these islands it would seriously modify the balance of power in the Mediterranean. A second appearance of the Italian fleet in the Dardanelles in July, 1912, threatened further complications. In August, 1912, Turkey first indicated a desire to end the war. This move was due, not so much to the activities of the Italians, as to reports of serious unrest among the Balkan states.

In the latter part of August, 1912, negotiations were begun between representatives of Italy and Turkey looking to a restoration of peace. The meetings were held at Ouchy, Switzerland. The chief difficulty arose from Italy's decree annexing the province of Tripoli, which Turkey would not accept. The precipitation of the Balkan War (q.v.), however, forced Turkey to accept such terms as she could obtain, and on Oct. 15, 1912, preliminaries to peace were signed. The terms of the Treaty of Lausanne provided that Italy should retain full sovereignty in Tripoli and Cyrenaica. At the same time Turkey was not required to recognize expressly the annexation, and Italy agreed to recognize the religious authority of the Sultan over the Moslem subjects in the territory. The Ægean Islands were restored to Turkey on condition that a general amnesty should be granted to the inhabitants and local autonomy respected.

The wider aspects of the war, in its effects upon the international situation in Europe, were of far-reaching importance. As had been anticipated, the disturbance of the status quo in one part of the Turkish dominions precipitated trouble elsewhere. The Balkan States, taking advantage of Turkey's difficulties, organized the Balkan League and began a war which reached its culmination in the tremendous conflict of 1914. See War in Europe, *Underlying Causes*.

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TURENNE, tụ'rĕn', Henri de Latour d'Auvergne, Vicomte de (1611–75). A marshal of France, born at Sedan, Sept. 11, 1611, the second son of Henry, Duke of Bouillon, and brought up in the Reformed faith. He entered the French army in 1630, served with distinction under Bernhard of Weimar in 1637–38, and won a victory over the Spaniards before Casale in 1640. He conquered Roussillon from Spain in 1642, and was rewarded with the baton of a marshal of France. In 1643 he commanded the army operating in Germany, where the French had sustained defeat by the Bavarians and Imperialists. With the Duke of Enghien (later Condé) he fought against General Mercy at Freiburg in August, 1644. After suffering his defeat by Mercy at Marienthal, May 5, 1645, he shared in Condé's victory near Nördlingen, August 3. The next year Turenne united with the Swedes to complete the conquest of Bavaria, and by his successes hastened the close of the Thirty Years' War (1648). Under the influence of his elder brother and the Duchess of Longueville (q.v.) he joined the Fronde (q.v.), but, with his Spanish allies, was defeated by Duplessis at Rethel in December, 1650. In 1651 he became reconciled with the court, and successfully commanded the royal armies against Condé, who meanwhile had gone over to the Fronde. In 1667, on the outbreak of the so-called War of Devolution (see Louis XIV), the King gave him the supreme command of the army, with which he overran Flanders and Franche-Comté. Louis XIV succeeded in inducing him to embrace the Catholic faith (1668). Turenne's campaign in Holland (1672) was a triumphant one; and the Elector of Brandenburg, who had ventured to side with the Dutch, was forced to sue for peace. In the following campaign, however, Turenne was outmanœuvred by the Imperialist general, Montecucculi. In 1674 he laid waste the Palatinate and defeated the Duke of Lorraine at Sinzheim. Forced from Alsace by superior forces, Turenne executed a masterly retreat, and found safety behind the Vosges Mountains; in a midwinter campaign he reconquered the country after two decisive victories at Mühlhausen and Türkheim. Once more he crossed the Rhine to meet his old rival, Montecucculi, but was killed while reconnoitring before Sasbach, near Offenburg, July 27, 1675. He was buried at St. Denis, and his body was placed by Napoleon in the Invalides.

Bibliography. Turenne left memoirs of his campaigns from 1643 to 1658, which are of interest to the student of military history (Paris, 1782; new ed., 1872); they are supplemented by the *Memoires* by Deschamps (ib., 1901); his letters were edited by Barthelemy (ib., 1874). Consult also: Henri Choppin, *La campagne de Turenne en Alsace, 1674–1675* (Paris, 1875); Paul Lümkemann, *Turennes letzter Feldzug, 1675* (Halle, 1883); L. de Piépape, *Turenne et l'invasion de la Champagne, 1649–1650* (Paris, 1889); Jules Roy, *Turenne: sa vie, les institutions militaires de son temps* (2d ed., Paris, 1898); F. des Robert, *Les campagnes de Turenne en Allemagne* (Nancy, 1903); Hardy de Périni, *Turenne et Condé, 1626–1675* (Paris, 1907); C. G. Picavet, *Les dernières années de Turenne, 1660–1675* (ib., 1914); id., *Documents biographiques sur Turenne, 1611–1675* (Lille, 1914).

TURGAI, tōōr-gī'. A territory of Russian Central Asia, an administrative division of the Governor-Generalship of the Steppes (Map: Asia, H 4). Area, 176,219 square miles. The larger part is flat, with sandy deserts in the south. The western part is covered with the Mugajar Mountains, offshoots of the Ural system. The region is watered by the Ural and the Tobol, which are almost waterless during the dry season. The flora is poor and the forests are few. The fauna, on the other hand, is very rich, especially in fur-bearing animals. The climate is continental, with extremely hot summers and severe winters.

Agriculture is as yet little developed. The nomadic Kirghizes are engaged principally in stock raising and hunting. The mineral deposits of the region, which include iron, copper, silver, coal, etc., are practically untouched. The natives export small articles of metal, saddles, musical instruments, carpets, etc. There are also exported furs and animal products. The barter system still prevails. Pop., 1913, 689,500.

TURGENEV, tụr-gĕn'yĕf, Alexander Ivanovitch (1785–1846). A Russian historian. He traveled extensively in Germany, Italy, France, and Denmark, making investigations in regard to the mediæval history of Russia. He published *Historiæ Russiæ Monumenta* (2 vols., 1841–42) and a *Supplementum* (1848).

TURGENEV, Ivan Sergeyevitch (1818–83). A Russian novelist. He was born at Orel, the son of a wealthy nobleman. At home he learned German and French, besides some English, while a self-taught serf implanted in him a love for the Russian poets. At 16 he entered the University of St. Petersburg. Here he came to know Pushkin, Belinsky, and other literary lights. After graduating, he went to Berlin to complete his studies, returning to St. Petersburg in 1841. His relations with his mother, formerly strained, were now openly broken off on account of her treatment of the serfs. He had to take service as a government clerk, but soon gave up his position and set himself to write. His poem *Parasha* (1845) was heartily praised by Belinsky. But it was the great success of *Kolosov* (1846) and *Khor and Kalinytch* (1847) that induced him to write the *Annals of a Sportsman* (1847–51). These sketches, pervaded with the spirit of humanity and a sincere love for the oppressed peasants, became the favorite book of Alexander II, then heir to the throne. When Turgenev's mother died in 1850 he immediately liberated all the serfs belonging to the estate. Meanwhile, he had incurred the suspicion of the government by his liberal utterances and in 1852 he was exiled to his estate, but was pardoned two years later. In 1855 Turgenev left Russia, and, except for a few visits to the country of his birth, spent most of his life abroad, mainly at Paris. He died at his Bougival villa, near Paris, in 1883, and was buried at St. Petersburg in the Volkov Cemetery, the funeral procession exceeding anything of the kind previously witnessed in Russia.

The great fame of Turgenev rests on his *Yakov Pasynkov* (1855); *Rudin, Faust* (1856); *Asya* (1858); *Nobles' Nest* or *Liza* (1859); *On the Eve*, or *First Love* (1860), and *Fathers and Sons* (1862). In these he turned to the mental and moral bankruptcy of the upper classes as resulting from a life of idleness amid hundreds of overworked serfs. *Fathers and Sons* marks an important point in Turgenev's career. Its hero, Bazarov, a young student disdaining all but utilitarian science, was called by the author by the newly coined name *nihilist*, meaning "a man who looks at everything from a critical point of view." With one or two exceptions the radical critics savagely attacked what was considered a caricature on the young generation. With the reactionaries Nihilism soon became equivalent to "respect for nothing," or "political unreliability," and this helped to widen still further the breach with the Liberals. The animosity of Turgenev's critics turned the melancholy manifest in his earlier works into pessimism, and his *Smoke* (1867) depicted the whole liberal movement of the sixties as a mirage. *Virgin Soil* (1876) pictured the new generation of the seventies. Here, as in his essay on *Hamlet and Don Quixote* of 1860, Turgenev fully applied his favorite division of all people into two types, one representing endless self-analysis and skepticism, the other enthusiastic devotion to the ideal. But Turgenev, living abroad, was no longer a faithful painter of the new social currents in Russian life. *Clara Militch* (1883), in spite of its mystical effect, is a story of the real life of the great Russian singer and actress Kadmina, who ended life by suicide on the stage of Kharkov. His *Senilia*, or *Prose Poems* (1883), are poetic gems in the most perfect prose.

Turgenev, the lineal literary descendant of Pushkin, is the greatest prose artist in the history of Russian letters. His figures do not stand out boldly against the background, but form an harmonious organic part of the whole scheme, and as such impress one still more forcibly when the whole scheme is comprehended. The language of Turgenev has been at once a model and source of despair for the young Russian writers. His influence on modern literature has been very great. His works appeared in 10 vols. (3d ed., St. Petersburg, 1891). There are English translations by Constance Garnett (London, 1894–97), and by Isabel F. Hapgood (New York, 1904). Consult: George Moore, *Impressions and Opinions* (New York, 1891); Borkowski, *Turgenjew* (Stuttgart, 1903); Haumant, *Tourguénief* (Paris, 1906); J. A. T. Lloyd, *Two Russian Reformers* (New York, 1911); W. L. Phelps, *Essays on Russian Novelists* (ib., 1912); P. S. Moxom, *Two Masters, Browning and Turgenev* (Boston, 1912), and in Russian the studies of A. Soloviev (St. Petersburg, 1908) and I. Ivanov (ib., 1914).

TURGENEV, Nikolai Ivanovitch (1790–1871). A Russian historian, brother of Alexander Ivanovitch. He studied at Göttingen, entered the civil service, and in 1813 was associated as Russian commissary with Baron Stein in governing the German provinces taken from France. He was afterward Deputy Secretary of the Interior and Agriculture in Russia. He advocated the emancipation of the serfs, and in 1825 was sentenced to death *in contumaciam*, for his connection with the insurrection of the Decembrists. He lived thenceforth in Paris, where he published *La Russie et les Russes* (1847).

TURGIDITY. See Turgor.

TURGITE, tûr′jīt (from *Turginsk*, a copper mine in the Ural Mountains). A hydrated ferric oxide that is found massive, with a dull, earthy lustre, and is reddish-black to dark-red in color. It is found in the Urals, in Prussia, and in the United States at Salisbury, Conn., where it occurs in large botryoidal masses with limonite which latter mineral it much resembles. Turgite is regarded as an intermediate stage in the alteration of limonite to hematite by the loss of water, and is a valuable ore of iron.

TUR′GOR (Lat., a swelling). The condition of a plant cell when it is stretched by the internal pressure of the cell sap. The word is also applied to the stretching force. The mature plant cell usually consists of a protoplasmic body, surrounded by an elastic membrane composed of cellulose and other materials, and inclosing one or more vacuoles filled with water, the cell sap. This is not pure water, but a solution of various substances, whose total osmotic pressure (see Osmosis) is usually equal to 4–30 atmospheres, and sometimes rises as high as 150 or more atmospheres. Whenever such a cell is surrounded by a solution of lower osmotic pressure, water will enter the cell and find its way to the vacuole. On account of the high osmotic pressure, the protoplasm is driven outward against the cell wall as water enters, and the cell wall itself is stretched (unless this is prevented by the opposing pressure of adjacent cells) until its resilience balances the outward pressure. This stretched state of the cell is favorable for growth (q.v.), and is the opposite of the condition known as plasmolysis (q.v.). Turgor may be reduced by the withdrawal of water from the cell, either by evaporation or by surrounding the cell with a solution of higher osmotic pressure than that inside it. Turgor of all the cells of a tissue renders the mass rigid. By the combined turgidity of all the tissues in the young parts of the plant or those whose cells are thin walled (e.g., leaves), such parts maintain their normal form. When turgor diminishes, the parts become flaccid.

TURGOT, tụr'gō', Anne Robert Jacques, Baron de l'Aulne (1727–81). A French economist and statesman. He was born in Paris, May 10, 1727, of an old family of Normandy, and was destined for an ecclesiastical career, but after studying awhile at the Sorbonne, where he won distinction, he turned from the Church and devoted himself to jurisprudence and political economy. Here he allied himself with the philosophical and liberal thought of his time. He was a contributor to the *Encyclopédie* and became a member of the physiocratic school of economists. He became councilor to the Parlement in 1752, and in 1761 was made intendant of Limoges, administering affairs there for 13 years, and carrying out within this field such reforms as ancient prejudices would allow. He introduced a more equitable administration of imposts, and succeeded in abolishing the old method of repairing roads and bridges by the compulsory labor of the poor inhabitants of the district, the corvée (q.v.). He also exerted himself for the protection of commerce. A wider field opened before him when he was called into the ministry after the death of Louis XV. The finances were in disorder, and the social and political system of France needed regeneration and reform. Turgot was first made Minister of Marine, and afterward Comptroller-General of France, when to fill that post was to be virtually Prime Minister. His first achievement was so far to reduce expenditure as to leave a surplus of 20 millions of francs a year to be applied to the liquidation of old debts. He augmented public revenue without imposing new taxes. An early measure was the carrying out of free trade in corn through the interior of France. He desired complete freedom of trade within the country, and to make the nobility and clergy contribute to the public revenue in the same proportion as the third estate. He wished, by means of provincial assemblies, to accustom the nation to public life, and prepare it for the restoration of the States-General. But the privileged classes whose exemptions were threatened, nobles, courtiers, farmers of the revenue, and financiers, united against him. The King forsook him, and Turgot retired in May, 1776, having held office only 20 months, afterward devoting himself to literary pursuits and scientific studies. His most important work, *Réflexions sur la formation et la distribution des richesses* (1766), is one of the chief productions of the physiocratic school. See Physiocrats.

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TÜRHEIM, Ulrich von. See Ulrich von Türheim.

TURIN, tū'rĭn *or* tū-rĭn' (It. *Torino*, pron. tō-rē'nō). The capital of the Province of Turin, in Piedmont, Italy, situated on the Po, here navigable near the junction of the Dora Riparia, 76 miles west-southwest of Milan (Map: Italy, A 2). Turin is an open unfortified town. It is unique among Italian cities because of its rectangularity of construction—long, straight, in part arcaded streets, rectangular blocks of houses or islands, and regular squares. It is well built, and is embellished with numerous squares, statues, and monuments, and beautiful parks. The extensive Piazza Castello, in the northeastern part of Turin, is the centre of the city's life. Thence the most important thoroughfares diverge, the fine Via di Po (the Corso of Turin) leading southeast to one of the four bridges over the Po, and traversing the large Piazza Vittorio Emanuele. In the Piazza Castello rises the mediæval Palazzo Madama, a huge ungainly pile, now occupied by various institutions. Northward looms the royal palace, a plain brick edifice, dating from 1660. Within it are located the valuable royal armory (with many historic relics of interest), a fine collection of coins, etc. Adjoining the palace is the royal park. Near it stands the commonplace Gothic cathedral of St. John the Baptist (1492–98), containing the fine impressive chapel of the Santissimo Sudario, treasuring some of the linen reported to have covered the body of the Saviour. The Palazzo Carignano, in the Carignano Square to the south, in which met the Sardinian Chamber of Deputies (1848–59), and the Italian Parliament (1860–64), holds natural history collections. The fine square of San Carlo is situated south of the Castello. The gardens of the Citadella, southwest of the royal palace, as well as the gardens of Carlo Felice, to the south, are both attractive. The public park is in the southeastern part of the city, along the left bank of the Po, where are also located the Botanical Gardens. On the eastern side of the Po rises the wooded Monte dei Cappuccini, 164 feet above the river. A short distance east of the city, on a height ascended by a cable railroad, is the royal burial church of the house of Savoy—the Superga—a splendid edifice affording a fine view. The most important monuments are those of Duke Victor Amadeus I, King Charles Albert, Duke Emmanuel Philibert, and the imposing monument of Cavour. The city has very little architecture of the Renaissance.

Turin is industrially and commercially prosperous. It manufactures mainly steel and iron products, silks, lace, velvet, ribbons, cotton and woolen stuffs, jewelry, porcelain, pianos, and furniture. Prominent among the exports are wine and silk.

Educationally Turin is prominent. (For the university, see Turin, University of.) The valuable National Library has some 350,000 volumes and 1500 manuscripts. Turin has among its numerous educational institutions a royal polytechnic school, an astronomical observatory (in the Palazzo Madama), a royal military school for artillery and engineer officers, a military school and hospital, a Liceo Musicale, an archiepiscopal seminary, an agricultural school, a philharmonic academy, four gymnasia, and an industrial school. In the Palace of the Academy of Sciences are the picture gallery and museums of antiquities and natural history. There are an Italian Industrial

Museum, the civic museum, and the museum of the Risorgimento Italiano, in honor of Victor Emmanuel II. The last is located in the modern Mole Antonelliana, a curious tower-shaped edifice, having a total height of 538 feet, thus overtopping the Cologne Cathedral and being probably the highest brick edifice in the world. The Royal Albertine Library, in the royal palace, contains 60,000 volumes and 3000 manuscripts. The Municipal Library has about 104,000 volumes.

Turin is an important military station, owing to its nearness to the French frontier and to the passes of the western Alps. The municipal debt is more than offset by the value of the municipal properties. Pop., 1911 (commune), 427,106; 1914 (est.), 445,582.

History. Turin was the chief city of the Ligurian Taurini. It was taken by Hannibal, and became a Roman colony in the time of Augustus, when it received the name of Augusta Taurinorum. It was prominent under the Lombards, became later the seat of marquises, and in the eleventh century passed to the house of Savoy. It has been repeatedly in the hands of the French. Here Prince Eugene won a brilliant victory over the French on Sept. 7, 1706. From 1861 to 1865 Turin was the capital of the new Kingdom of Italy. Consult: Promis, *Storia dell' antica Torino* (Turin, 1871); Borbonese, *Torino illustrata e descritta* (ib., 1884); E. C. Babut, *Le concile de Turin: Essai sur l'histoire des églises provençales au Ve siècle* (Paris, 1904).

TURIN, CLAUDIUS OF. See CLAUDIUS OF TURIN.

TURIN, UNIVERSITY OF. An Italian university founded in 1405 by Louis of Savoy. It became at once a refuge for the professors at the universities of Pavia and Piacenza, then suffering from civil wars. Towards the latter part of the fifteenth century it shared the general reputation and prosperity of the Italian universities of that period. It comprised two colleges, one founded in 1457 (Collegio Grassi), and one in 1482. The university was reorganized in 1632, and in 1713 the present building was erected. The university has faculties of law, medicine and surgery, philosophy and letters, and physical, natural, and mathematical sciences, and a school of pharmacy. In 1912–13 there were about 2199 students. There are connected with the university the Collegio Carlo Alberto and the Instituto Dionisio.

TURIN PAPYRUS. A hieratic papyrus, preserved in the Museum of Turin, containing a dynastic list of the kings of Egypt. It formed part of the collection offered for sale to the French government in 1818 by M. Dovretti, the French Consul General in Egypt, and was at that time perfectly preserved. The French government declining to buy it, the papyrus afterward was acquired by the King of Sardinia and was finally sent to Turin. It was, however, carelessly packed, and on its arrival it was found to be broken into 164 fragments. Champollion (q.v.) was the first to recognize its nature and value, and in 1824 collected from it between 160 and 180 royal prænomens, but, except in a very few cases, was unable to determine the order of succession. In 1826 Seyffarth (q.v.) attempted to piece together the broken fragments and reconstruct the papyrus, but his attempted restoration is altogether unreliable, partly on account of his limited knowledge of the hieratic character, and partly because a large proportion of the fragments are so minute as to afford little or no indication of their proper order. Subsequent attempts to restore the text have met with little success. In its original condition the Turin Papyrus contained a list of the kings of Egypt, beginning with the mythical period and ending with Dynasties XV and XVI, with the exact duration of each monarch's reign in years, months, and days. It would supply, if complete, an invaluable guide for the earlier period of Egyptian history, but in its present mutilated state it is of little use for historical and chronological purposes except in the portions covering the thirteenth and fourteenth dynasties, where the text is somewhat better preserved. Elsewhere the papyrus serves at best to confirm data derived from other sources, and furnishes scarcely any independent information. The text is published in Lepsius, *Auswahl der wichtigsten Urkunden des ägyptischen Alterthums* (Berlin, 1842), and in Wilkinson, *The Fragments of the Hieratic Papyrus at Turin* (London, 1851). Consult: *Transactions of the Royal Society of Literature*, 2d series, vol. i (London, 1843); *Revue archéologique*, vol. vii (Paris, 1850); K. A. Wiedemann, *Aegyptische Geschichte* (Gotha, 1884–88); E. A. T. Wallis Budge, *A History of Egypt* (New York, 1902); J. H. Breasted, *Ancient Records of Egypt* (Chicago, 1907).

TURKESTAN, tụr'kĕ-stän', *Turk. pron.* tōōr'-ke-stän'. An extensive region in Central Asia, included between the Russian territory of the Steppes on the north, the Mongolian Desert on the east, Tibet, India, Afghanistan, and Persia on the south, and the Caspian Sea on the west. A portion of Turkestan territory is comprised within Afghanistan. Politically the region is divided into western or Russian Turkestan and eastern or Chinese Turkestan. The Russian protectorates of Khiva and Bokhara and the Russian Province of Transcaspia are now considered and treated as separate divisions.

Russian Turkestan. This region embraces the territories of Ferghana, Samarkand, Semiryetchensk, and Syr-Darya (Map: Asia, F 4). Total area, about 420,807 square miles; total population in 1912, 6,416,700; on Jan. 1, 1914 (estimated), 6,250,300. Together with the Transcaspian province and a portion of the Pamir, it constitutes the general government of Russian Turkestan. It is bordered by the territory of the Steppes on the north, Sungaria and Chinese Turkestan on the east, Bokhara and Khiva on the south, and Khiva and the Sea of Aral on the west. The western and northern parts are gently rolling surfaces sparsely clothed in spots with bushes and shrubs. Here are the great deserts of Kara-kum, Kizil-kum, and Mujun-kum. In the northeast is the extensive Lake Balkhash. In the south there are mountains belonging to the three systems of the Hissar, the Alai, and Tian Shan, and form a wild Alpine-like district, interspersed with fertile valleys. The Karatau chain stretches northwest across the territory of Syr-Darya and divides it into two parts. There are numerous oases. The Syr-Darya, rising on the central mountain border, flows west through the centre of Ferghana, then northwest along the southwestern side of the Karatau, finally reaching the Sea of Aral. The Ili, an affluent of Lake Balkhash, is the chief river in the East. It flows northwest through the centre of Semiryetchensk. These streams have numerous tributaries. The southern section of Russian Turkestan is subject to earthquakes. The climate is continental. The summers are hot and dry and the winters comparatively severe and accompanied by destructive snowstorms. The flora in the west belongs to the Aral Sea district, in the east to the mid-Asiatic region. The fauna, though essentially of the Central Asiatic type, comprises many tropical representatives, among them the tiger. Salt, coal, and asphalt are obtained, and precious stones are exported. Ferghana and Samarkand are connected with the Caspian Sea by a railroad.

Numerous irrigation canals tap the rivers and provide agricultural conditions which would otherwise be impossible. This is especially true in the southern part of the country, where the bulk of the population is located. The staple crops are wheat, rice, millet, and oats. Cotton is a promising crop in Ferghana. Rice and cocoon silk are also produced in noteworthy quantities. Various kinds of fruit, including the grape, thrive. Stock raising, however, is the leading occupation. Great numbers of sheep are reared. The reported number of live stock in 1914 was: horses, 2,028,494; horned cattle, 2,151,465; sheep and goats, 7,236,055 (of which 5,223,208 in Syr-Darya); swine, 59,183. There are said to be over 1,000,000 camels. The domestic industries are widespread, and some of the native products, such as carpets and rugs, are highly valued in Europe. The manufacturing industries properly so called are in their infancy. The exports consist chiefly of raw products, which go largely to Russia. The Transcaspian Railway has been a great pacificator in Russian Turkestan. It reached Samarkand in 1888 and has been extended to Tashkent and Andijan. From Tashkent a line runs northwest to Orenburg on the European frontier. While the general administration is intrusted to Russian officials, the natives suffer little interference, and taxation is scarcely more than nominal. Public education is almost entirely in the hands of the native religious bodies, although the Russian government has shown considerable concern for the instruction of the natives. The inhabitants are almost wholly Mohammedans. The Kirghizes form about 36 per cent, the Sarts 24 per cent, and the Usbegs and Kiptchaks together 19 per cent. The Russians, therefore, constitute but a small element. The leading cities are Tashkent, Khokand, Namangan, and Samarkand. Andijan was ruined by an earthquake in 1902.

Chinese or Eastern Turkestan. A dependency of China, bordered on the north by Sungaria, on the east by Mongolia, on the south by Tibet, on the southwest by Kashmir, and on the west and northwest by the Pamir and Russian Turkestan. The country is isolated and forbidding in many aspects; a large and elevated desert plateau, surrounded by lofty mountain ranges, of which the Tian Shan lines the northern frontier, and the Kuenlun, Altyn Tag, and the spurs of the Karakorum the southern. The southern range reaches more than 18,000 feet. The desert of Gobi occupies a portion of the eastern section. The mean elevation of Chinese Turkestan is assumed to be about 3500 feet, but there are a number of markedly low levels, and along the southern face of the Bogdo-Ola mountains, in the depression of Luktchun, the surface drops 425 feet below sea level. The region is watered chiefly by the Tarim River (q.v.), which rises in the west, and its tributaries. At the foot of the frontier ranges, over 4000 feet above sea level, there are chains of extraordinarily fertile oases which mark the chief caravan routes of the region. Along the foot of the Tian Shan stretches a series of lakes, of which the largest is the Bagrach Kul.

The climate is severe and extremely dry. Domestic animals abound, and the tiger, jackal, wild camel, bear, and wolf are found. The oases and the strips along the base of the mountain ranges alone offer conditions for permanent habitation. The people are engaged principally in agriculture, stock raising, commerce, and hunting. Cotton, silk, and animal products are exported, and in some of the larger cities, such as Yarkand, Khotan, Aksu, and Kashgar, there are manufactured copper ware, silk, carpet, felt, and leather goods. There are extensive mineral resources, but mining is engaged in only by the natives and accordingly in a primitive way. Asbestos, sulphur, and saltpetre are obtained. A heavy caravan commerce traverses eastern Turkestan en route to and from China, this region being in the direct central western route. Administratively, eastern Turkestan has formed since 1885 a part of the Chinese Province of Sinkiang, and is divided into the three dao-tais of Kashgar, Aksu, and Urumchi (qq.v.). The seat of the administration is at Urumchi (Tihwafu). The population is estimated at 2,000,000 and is of mixed Aryan and Turanian descent. The most numerous are the Kirghizes, Sarts, Kalmucks, Usbegs, and Tajiks. The language is eastern Turkish with an admixture of Chinese words.

History. (See BOKHARA, KHIVA, MONGOL DYNASTIES, SAMARKAND, ETC.) The invasion of Central Asia by Russia began soon after the conquest of Siberia, and desultory raids on Khiva by pioneers from the north were made as early as the end of the sixteenth century. The expedition into Central Asia sent out by Peter the Great in 1714 ended in disaster, but the submission of the Kirghizes during the eighteenth century gave Russia the territory between the Ural and the Lake of Balkhash. In 1839 a well-equipped Russian army sent against Khiva under the command of Perovski succumbed to cold, hunger, and sickness. By the end of the first half of the nineteenth century Russian forts were established at the mouth of the Syr-Darya and during the following decades a chain of Russian forts was built along the southern frontier. In 1854 a second expedition under Perovski against Khiva met with success. In 1867 the Governor-Generalship of Turkestan was established with Tashkent as the capital. In the following year Samarkand was taken and a treaty of peace was concluded with the Ameer of Bokhara by which Russia acquired a considerable part of the Zerafshan valley, and Bokhara became practically a vassal state of Russia. In 1873 a Russian expedition forced the Khan of Khiva to cede to Bokhara the Khivan territories on the right bank of the Amu-Darya, which were soon annexed by Russia. In 1876 Russia annexed the Khanate of Khokand (Ferghana). The subjugation of the Tekke-Turkomans was terminated with the capture of Geök-Tepe by Skobeleff in 1881. The Turkomans of Merv submitted in 1884. In 1887 the Afghan boundary was demarcated by an Anglo-Russian commission.

The authentic history of Chinese Turkestan can be traced almost to the beginning of the

Christian era, when the region was partly under the rule of China. Buddhism was then the predominating religion, but there were also sects of Nestorian Christians. In the seventh century the western part of the country fell under the sway of Tibet, whose rule had been extended by the end of the century to the entire region. Islam began to spread over eastern Turkestan in the tenth century, but even with the conquest of the country by Genghis Khan (q.v.) at the beginning of the thirteenth century there was perfect toleration. It was only with the arrival of the mollahs from Bokhara in the fourteenth century that Islam became a cause of strife, and gave rise to the two factions of White and Black Mountaineers, whose struggles gave China an opportunity to reconquer the country at the end of the eighteenth century. The history of eastern Turkestan during the nineteenth century is largely made up of repeated attempts on the part of the followers of Islam to wrest the country from the rule of China. From 1872 to 1876 eastern Turkestan was practically independent under Yakub Beg, but the rule of China was restored soon after his death.

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TURKESTAN. A town in the Territory of Syr-Darya, Russian Turkestan, situated about 20 miles east of the right bank of the Syr-Darya, about 180 miles northwest of Tashkent (Map: Asia, H 4). The Mosque of Hazret-Yassavi, erected by Timur, is a noted place of pilgrimage. Pop., over 16,000.

TUR′KEY, or THE OTTOMAN EMPIRE (so named from its founder, Othman). An Empire in Europe and Asia, with its capital at Constantinople. The bulk of the territories over which the Turkish Sultan exercises actual sovereignty is Turkey in Asia which has an area of 699,342 square miles. This includes Asia Minor, Armenia and Kurdistan, Mesopotamia, Syria, and a broad strip of country extending the whole length of Arabia along the west coast, containing Mecca. The European territory under Turkish rule, which before the Balkan War (q.v.) amounted to 65,370 square miles, has been lessened by division among the states of Bulgaria, Servia, Montenegro, Greece, and Albania, so that in 1915 it comprised but 10,882 square miles. Turkish territory has been further depleted by the loss of Tripoli, annexed to the Italian Empire in 1912; of Egypt, proclaimed a British Protectorate in 1915, and of Samos held by Greece. See WAR IN EUROPE.

The European possession has lost since the Balkan War one-half of her sea coast on the Black Sea, all of the Adriatic coast line and about four-fifths of the Ægean Sea border. The area, unlike the remaining Balkan states, possesses no great elevations. Above the low coasts of the Black Sea rise hills of small relief, west of which is the fertile valley of the Maritza River. A shaggy range of hills skirts the Sea of Marmora and continues into the Gallipoli Peninsula. The rocks on both sides of the Bosporus are Devonian and the coast hills, which are separated from the rest of the Balkans by a wide plain covered with recent formations, are more connected with Asia than with Europe. The Maritza valley and its main tributary in Turkey, the Ergene, forming a broad lowland less than 600 feet high and comprising over one-half the state, are of great fertility and yield easy lines of communication.

The Black and Ægean seas are poor in havens, but the winding river-like strait of the Bosporus, which connects the Black Sea with the Sea of Marmora, and through it with the Mediterranean, has ample depth for the largest vessels. Here is the magnificent harbor of Constantinople, the great meeting place of eastern and western trade. On the strait of the Dardanelles, leading from the Sea of Marmora into the Mediterranean, is the harbor of Gallipoli. Turkey has a Mediterranean climate which is characterized by a high percentage of sunshine and limited rain, in this case about 20 inches per year. At Constantinople the mean temperature in January is 43° F., and in July 72.5°. For other parts of the empire, see articles on ANATOLIA (Asia Minor), SYRIA, ARMENIA, HEJAZ, YEMEN, ETC.

Agriculture, etc. Most of the people of Turkey live by farming and sheep raising, but as these industries are in a backward condition, the rural population is very poor. This condition is due to misgovernment, ignorance, lack of roads and railroads, and an unfavorable system of land distribution. Little land is held in freehold, the greater part being either crown property or vakuf, i.e., held in mortmain for the benefit of the Moslem church. A system of agrarian reform laws was promulgated in 1913, and a number of government agricultural schools have been recently established. In parts of the Empire the problem of insufficient rainfall is being met by extensive irrigation projects, notably in Mesopotamia and Palestine. The use of fertilizer is practically unknown, but the soil is so productive that Turkey is an exporter of foodstuffs. Agricultural products include cereals of all sorts, grapes, raisins, and wine, olives and olive oil, coffee, opium, nuts, sesame, flax, hemp, coleseed, licorice, oranges and lemons, dates, figs, and attar of roses. The cotton industry, which dates only from 1905, is rapidly developing, and probably reaches 200,000 bales annually. Silk culture is encouraged by the government, most of the raw silk being shipped to France. Turkish tobacco is world-famous. In Asiatic Turkey there are about 16,500,000 acres under cultivation. In eastern Asia Minor, sheep, goats, and small horses are raised, and wool, goats' hair, hides, and gut are exported. In Palestine, recently established Zionist colonies have been successful exporting cereals, cotton, and fruits. In 1913, 1,608,500 boxes of oranges were shipped from Jaffa. Turkey has been badly deforested, its wooded area being now about 20,000,000 acres. Forestry laws modeled on those of France have been passed and the reforestation has begun. Sponge fishing is an industry of the Mediterranean coast, and the local fisheries of the Bosporus are valued at about $1,000,000 a year.

Mining. Asia Minor and Kurdistan are exceedingly rich in minerals, though these are little known and less worked. Silver is found near Konia, and rich copper deposits near Trebizond, Diarbekr, and in the Armenian Taurus Mountains. Considerable coal fields exist in several districts, that near Heraclea on the Black Sea being operated by French capital. Salt, a government monopoly, is exported. Gold, zinc, lead, and iron have been found but are little exploited. Petroleum has been discovered near Rodosto, Jerusalem, and in the Tigris-Euphrates valley.

Manufactures. There is little manufacturing. At Constantinople, there are flour mills, two glass factories, a soap factory, a dry dock and arsenal. Cloth is manufactured in Constantinople, Smyrna, and Ismid; and some silk in Brusa and Damascus. Olive oil and soap are made and exported. Artisans produce brass and copper utensils of considerable beauty, and the hand-woven Turkish rugs are a very valuable export. The reasons for the state of manufacturing in Turkey are the lack of skilled labor, and the impossibility of competing in the local market against Europe and America.

Commerce. The commerce of the Empire is largely in the hands of Greeks, Jews, Armenians, and foreigners. The imports always exceed the exports in value. The leading exports are barley, and other cereals, raisins, goats' hair, wool, opium, rugs and carpets, tobacco, dried and fresh fruits, nuts, licorice, coleseed, attar of roses, raw silk, hides, gut, and cotton. Manufactured goods of all kinds are imported. Trade is chiefly with the United Kingdom, Austria-Hungary, France, Germany, Russia, Bulgaria, and Italy. Commerce with the United States is growing rapidly, Turkey exporting rugs, tobacco, hides, olive oil, and wool, in return for cloth, petroleum, and iron and steel goods. Total exports and imports for years

	1910–11	1911–12
Imports	$187,238,298	$193,024,000
Exports	97,150,710	105,009,000

In 1914, imports from the United States, $3,328,519; exports to the United States, $20,843,077.

Transportation and Communication. Lack of means of transportation has always been a hindrance to Turkish development, but within recent years the railway system has been extended rapidly. In Europe, Constantinople has direct rail connection with Paris and Berlin through the Balkans, and with Dedeaghatch and Saloniki on the Ægean. In Asia, Haidar Pasha (Constantinople), Smyrna, and Beirut are railroad centres. From Haidar Pasha the Bagdad Railway has been completed as far as the Taurus Mountains, which must be pierced by one of the longest tunnels in the world. Beyond the Taurus, the line has been run to Nisibin, and from the Bagdad terminus back to Samara. Three lines run in from Smyrna—one to the Marmora Sea at Panderma, one south and east to Eyerdir, one meeting the Bagdad Railway at Afium-Kara-Hissar. From Beirut there is rail connection with Aleppo and with Damascus, the head of the Hedjaz Railway. At the outbreak of the European War in 1914, there were about 1050 miles in European Turkey and 2836 in Asiatic Turkey.

The Turkish mercantile marine in 1911 listed 120 steamers of 66,878 tons, and 963 sailing vessels of 205,641 tons. In 1913, 18,285 vessels of 17,397,888 tons entered and cleared at Constantinople. English, Russian, Austrian, German, Turkish, French, Greek, Rumanian, and Italian lines call regularly at Constantinople, and there are direct sailings to New York.

Up to Oct. 1, 1914, most of the Powers maintained extraterritorial post offices in Turkey. Since that date the postal service, mail and parcel, has been in Turkish hands exclusively. There are 28,890 miles of telegraphs in the Empire. Constantinople, Smyrna, Damascus, and Beirut have electric street railways.

Government. Turkey is a limited monarchy, at the head of which is the Sultan or *Padishah*, who is also Caliph (successor of the prophet Mohammed, and head of the orthodox Moslem world). Imperial succession vests in the oldest member of the reigning house of Othman.

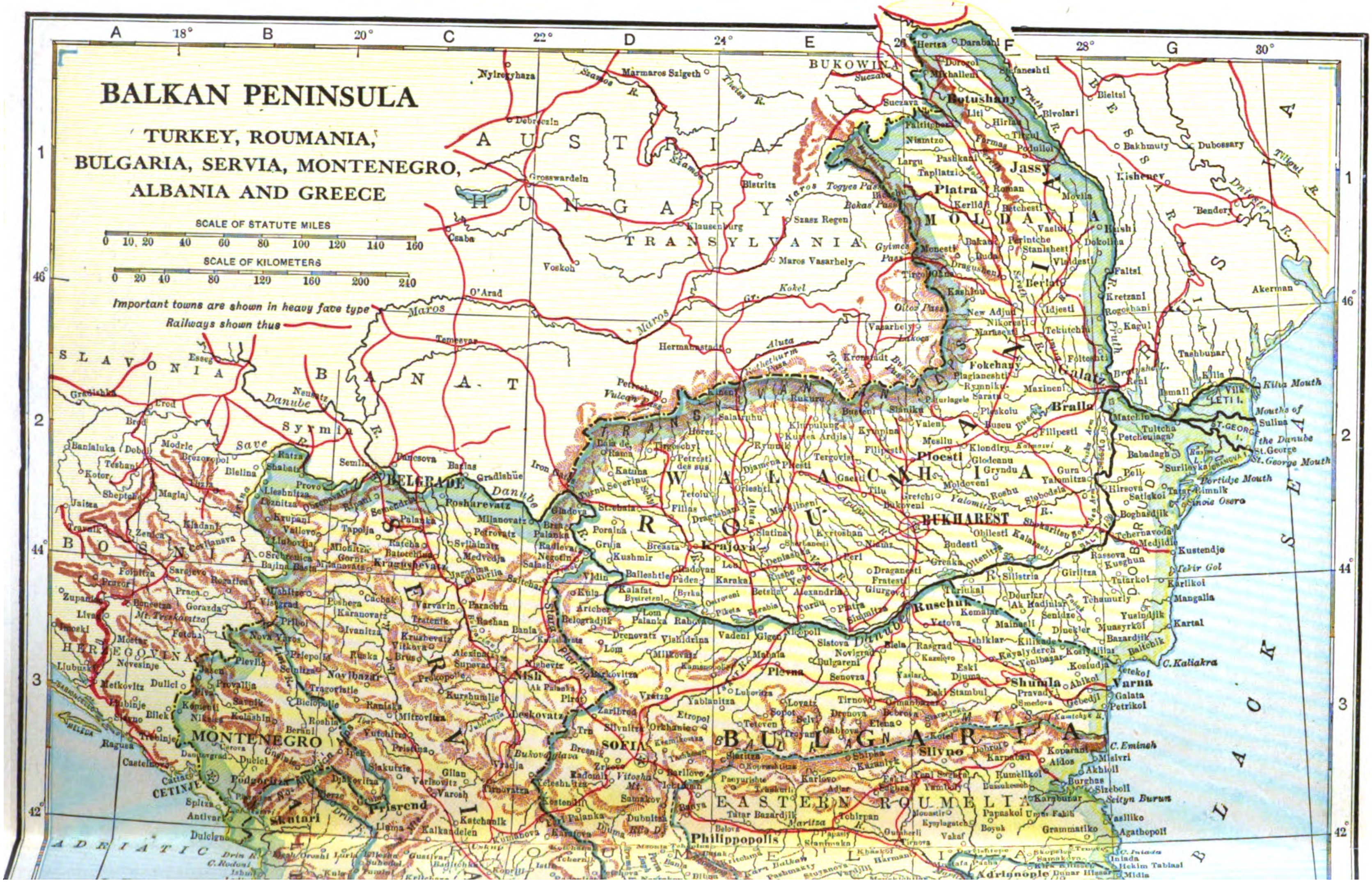
The constitution, which was granted in 1876, suspended in 1878, and restored by the revolution of July 23, 1908, provides for a ministerial form of government, the Grand Vizier, or Prime Minister, being assisted by a cabinet of 11, including the Sheik ul Islam. The latter is appointed by the Sultan with the approval of the *Ulema* (Moslem clergy) and has the power of vetoing any imperial decree or parliamentary law by declaring it contrary to the Sacred Law. The Empire is divided into 23 *vilayets* (provinces), besides several separately organized *sanjaks*, and the Lebanon district. The *vilayets* are divided into *sanjaks*, *cazas*, and *nahiehs*. Each *vilayet* is governed by a *vali*, appointed by the Sultan, and assisted by a provincial council. The *vali* appoints the subordinate officials of the *vilayet*.

The Parliament consists of a Senate and a Chamber of Deputies. The senators are appointed for life by the Sultan; the deputies are chosen by indirect election, one deputy for 6000 qualified electors. The two-party system obtains. There is no legal discrimination by reason of race or creed.

Turkish law is very complicated, there being two recognized systems in force. One is the Sacred Law (*Sheriat*) which rests upon the Koran, the traditions of the Prophet, and the precedents of the early Caliphs. This system applies in certain cases involving real property, or the personal status of Mohammedans. The other system, which includes the bulk of modern legislation, and is applicable in most civil and criminal cases, is based upon the French *Code Napoléon*.

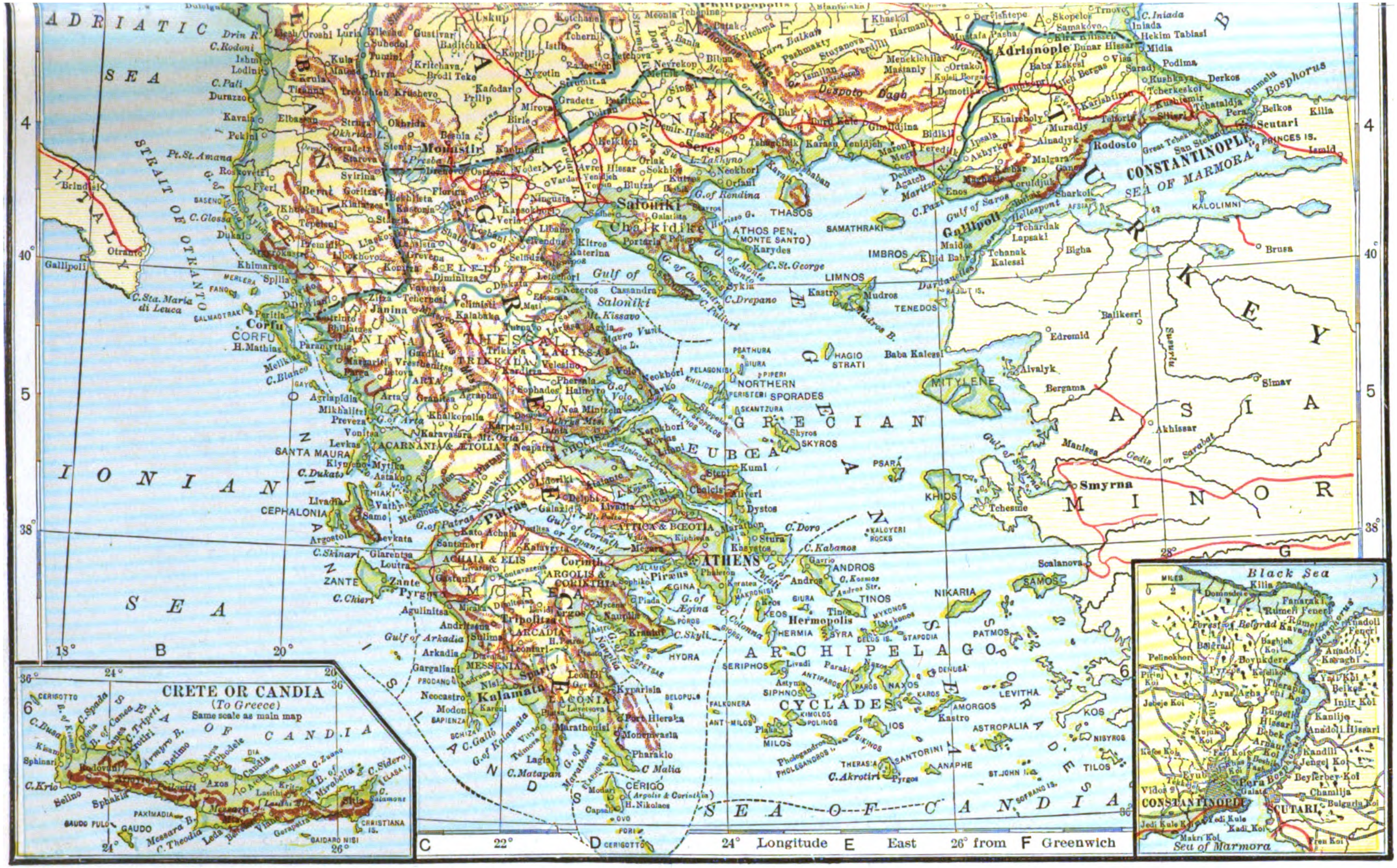
Foreigners in Turkey formerly enjoyed unusual extraterritorial privileges guaranteed by a series of treaties called Capitulations. In September, 1914, Turkey abrogated these treaties, but none of the Powers recognized this unilateral act.

Finance and Banking. Imperial revenues are derived from direct taxes, from the tobacco, salt, and explosives monopolies, and from the



BALKAN PENINSULA

TURKEY, ROUMANIA, BULGARIA, SERVIA, MONTENEGRO, ALBANIA AND GREECE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Gallipoli
Smyrna
ATHENS
Piræus
Corinth
Patras
Tripolitza
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Janina
Monastir
Corfu
CEPHALONIA
ZANTE
SANTA MAURA
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SAMATHRAKI
IMBROS
LIMNOS
TENEDOS
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KHIOS
SAMOS
NIKARIA
PATMOS
ANDROS
TINOS
NAXOS
MILOS
SANTORINI
CERIGO
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Gulf of Corinth
Gulf of Patras
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Longitude East from Greenwich
CRETE OR CANDIA
(To Greece)
Same scale as main map
SEA OF CANDIA
Candia
Canea
Retimo
GAUDO
Black Sea
CONSTANTINOPLE
SCUTARI
Sea of Marmora
MILES

tariff. The largest expenditures are for military purposes and for the national debts. Definite figures for revenue and expenditure are unobtainable, but the estimates for the fiscal year 1913–14 put the revenue at about $120,000,000 and the expenditures at $185,000,000. Up to 1914 the national debt amounted to $667,286,430.80, of which 62 per cent was held in France and 29 per cent in Germany. There was also a floating debt of $176,000,000. The Imperial Ottoman Bank in 1910 had a capital of $44,000,000. This bank issued the paper currency of the Empire in notes of five pounds Turkish and one pound Turkish, secured on a gold reserve of not less than one-third of the value of the issue.

Up to 1914 the Turkish tariff was fixed by the Powers. In 1907 it was raised from 8 per cent to 11 per cent ad valorem for seven years. In October, 1914, without the consent of the Powers Turkey raised the tariff to 15 per cent ad valorem.

Army. The reorganization of the Turkish army, since 1909, has been directed and controlled in large part by German officers. Under Enver Pasha, the Turkish Minister of War, in the early part of the year 1914 the powers of the "German Military Mission" were greatly amplified, even to the extent of placing German officers in command of Turkish troops. Soon after his assumption of the duties of War Minister, Jan. 4, 1914, Enver Pasha introduced universal military training, applicable not only to all Moslems but to Christians previously, in great part, exempted from military training and service. There were no exemptions, but those, both Moslem and Christians, who were able to pay a large military tax, were excused from a portion of the full period of military training. The new men and funds secured in this manner were used to fill up the regular organizations which had been greatly depleted by the Balkan War of 1912–13.

Under the new régime service was from the age of 20 to 45, as follows: In the active army, or "Nizam," two years for the infantry, three for the other arms; in the first reserve, "Ihtiat," to the age of 40; in the second reserve or Territorial army, "Mustahfiz," from 40 to 45. Under this scheme, in 1914, the Nizam, or active army, was first filled up with trained men, those remaining forming the nucleus for reserve battalions stationed at training depots to which the untrained men were sent for instruction. From these battalions men were sent to fill the vacancies occurring in the fighting lines. The Kurdish cavalry are tribal militia organizations, service in which exempts from compulsory service in the regular army. This cavalry was called for service with the field army after the outbreak of war.

Turkey, after the Balkan War, was divided into four territorial and inspection districts in which army corps and divisions were located and recruited as follows: First district, Turkey in Europe and western Anatolia, five army corps of three divisions each; second district, Syria, two army corps of three divisions each; third district, Kurdistan and eastern Anatolia, three army corps of three divisions each; fourth district, Mesopotamia, two army corps of two divisions each; besides these, in Yemen, one corps of two divisions; Hejaz, one division; Assir, one division; total, 13 corps and two independent divisions, or 38 divisions in all.

It should be noted that the Turkish division consists of only three regiments of three battalions each, or a total of nine battalions of infantry and from six to nine batteries of field or mountain artillery. A battery has four guns, except when armed with old models, when six guns are assigned. The corps, as shown above, consists of either two or three divisions, to which are attached either a regiment or brigade of cavalry, three howitzer batteries, an engineer battalion, a supply battalion, and a telegraph company. There are 25 regiments of cavalry of five squadrons each in addition to the Kurdish cavalry already mentioned.

Under the reorganization of 1915, the peace strength was estimated at 200,000; initial mobilization at the outbreak of the European War, at 750,000; ultimate war strength of the field armies, 1,000,000. In addition to these forces there are the Gendarmerie, or military police, amounting in all to about 60,000 men, of whom about 16,000 are mounted. During the European War most of this force were called into active service, their places being filled by the older reservists of the Mustahfiz. The Lebanon militia is a local police force consisting of two battalions of infantry and one squadron of cavalry.

At the head of the army is a War Minister assisted by a permanent assistant secretary or Musteshar, and by the Chief of the General Staff, which, upon mobilization for the European War, contained a number of German military officers. Munition factories are under the direction of an official called the Director General of Military Factories, who presents an independent budget for the consideration of the government.

Infantry are armed with the 7.65 mm. Mauser magazine rifle, of which there was a great shortage after the Balkan War. Field artillery have the 7.5 cm. quick-fire Krupp gun. Of these, too, there was a shortage due to losses in the Balkan War. As soon as practicable after Turkey entered the European War, arms and equipment were supplied by the Teutonic Powers. Germany, in addition to supplying the field armies of Turkey, also greatly strengthened the fortifications at Adrianople, Chatalja, the Bosporus and Dardanelles, Smyrna, and Erzerum in Armenia.

Navy. See under NAVIES.

Money, Weights, and Measures. The coinage is on the decimal system, with the gold standard. The unit is the piaster, worth 4.4 cents American, with 100 piasters to the pound Turkish. The silver currency is normally depreciated about 5 per cent. Nominal value of the coinage since 1880 is: gold, $185,342,612.40, and silver, $46,295,326, besides a copper and nickel currency.

The metric system of weights and measures was adopted in 1882 and is used in the larger cities.

Population. As there has never been a census, figures of the population of the Empire are approximate only. In 1914, Turkey in Europe and Asia had an area of 710,224 square miles and a population of 21,273,900. Besides there was Cyprus, administered by England, and the tributary province of Egypt and the Sudan. After the outbreak of the great war Cyprus was declared annexed to the British Empire and Egypt was declared a British protectorate. Certain Ægean islands, including the Dodecanese.

claimed by Turkey, are now in the possession of Greece and Italy; their legal status is uncertain.

DISTRICT	Area in sq. miles	Population
Turkey in Europe	10,882	1,891,000
Turkey in Asia:		
Asia Minor	199,272	10,186,900
Kurdistan (Armenia)	71,990	2,470,900
Mesopotamia	143,250	2,000,000
Syria	114,530	3,675,100
Arabia	170,300	1,050,000
Grand total	710,224	21,273,900
Cyprus	3,584	286,922
Egypt	12,226	11,189,978
Sudan	984,520	2,600,000

The division of the population of Turkey, except Egypt, by races is roughly estimated: Turks, 10,000,000; Arabs, 4,000,000; Greeks, 2,000,000; Kurds, 1,600,000; Armenians, 1,500,000; Syrians, 1,500,000. The remainder includes Jews, Druses, Lazes, Circassians, and other races. Constantinople, Smyrna, Bagdad, Damascus, Aleppo, Beirut, and Brusa have populations of over 100,000. The figures below refer to 1914.

VILAYET	Area in sq. miles	Population
In Europe:		
Constantinople	1,505	1,203,000
Chatalja (sanjak)	733	78,000
Adrianople	8,644	610,000
Total in Europe	10,882	1,891,000
In Asia:		
Asia Minor:		
Ismid (sanjak)	3,130	222,700
Brusa	25,400	1,626,800
Bigha (sanjak)	2,550	129,500
Smyrna	25,801	2,500,000
Kastamuni	19,570	961,200
Angora	27,370	932,800
Konia	39,410	1,069,000
Adana	15,400	422,400
Sivas	23,970	1,057,500
Trebizond	16,671	1,265,000
Total	199,272	10,186,900
Kurdistan (Armenia):		
Erzerum	19,180	645,700
Mamuret el Aziz	12,700	575,200
Diarbekr	14,480	471,500
Bitlis	10,460	398,700
Van	15,170	379,800
Total	71,990	2,470,900
Mesopotamia:		
Mosul	35,130	500,000
Bagdad	54,540	900,000
Basra	53,580	600,000
Total	143,250	2,000,000
Syria:		
Aleppo	33,430	1,500,000
Zor (sanjak)	30,110	100,000
Syria	37,020	1,000,000
Beirut	6,180	533,500
Jerusalem (sanjak)	6,600	341,600
Lebanon	1,190	200,000
Total	114,530	3,675,100
Arabia:		
Hedjaz	96,500	300,000
Yemen	73,800	750,000
Total	170,300	1,050,000
Grand total	710,224	21,273,900

Education and Religion. Most of the inhabitants are Moslems and Mohammedanism is the state religion, with the Sultan as Caliph as the head of the religion, and the Sheikh-ul-Islam as the leading ecclesiastic, representing the Church in the cabinet. All religions are tolerated except idolatry, and the government recognizes 13 non-Mohammedan communities or *Millets*—Roman Catholics, Greek Orthodox, Armenian Gregorians, Armenian Catholics, Protestants, Chaldean Catholics, Nestorians, Syrian Catholics, Syrian Jacobites, Melchites, Jews, Bulgarian Catholics, and Maronites. These communities are ecclesiastically self-governing and their spiritual heads exercise civil functions of considerable importance. To a great extent they control the education of their children through their parochial schools.

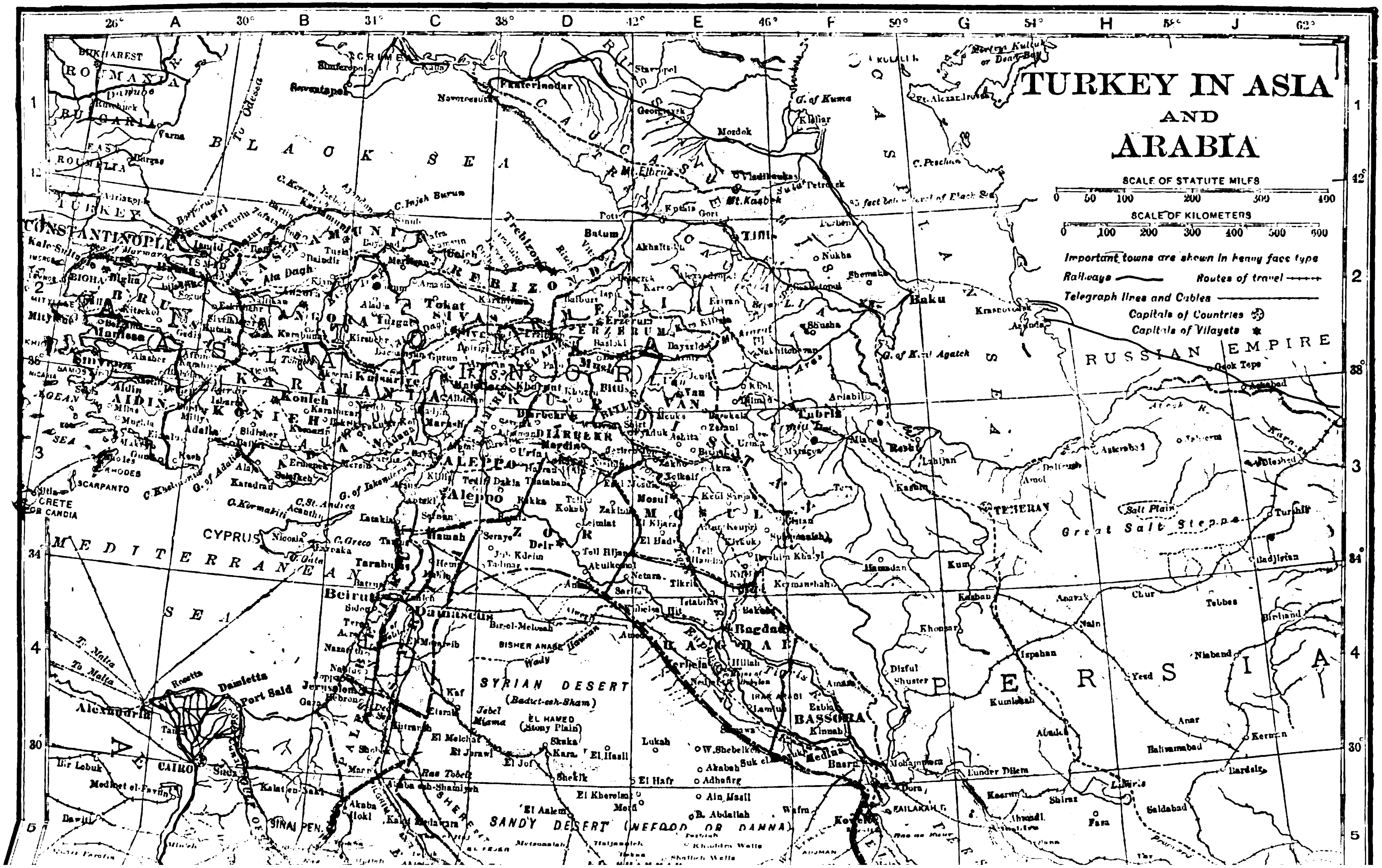
The majority of the Mohammedans belong to the Sunni sect, though other sects are represented.

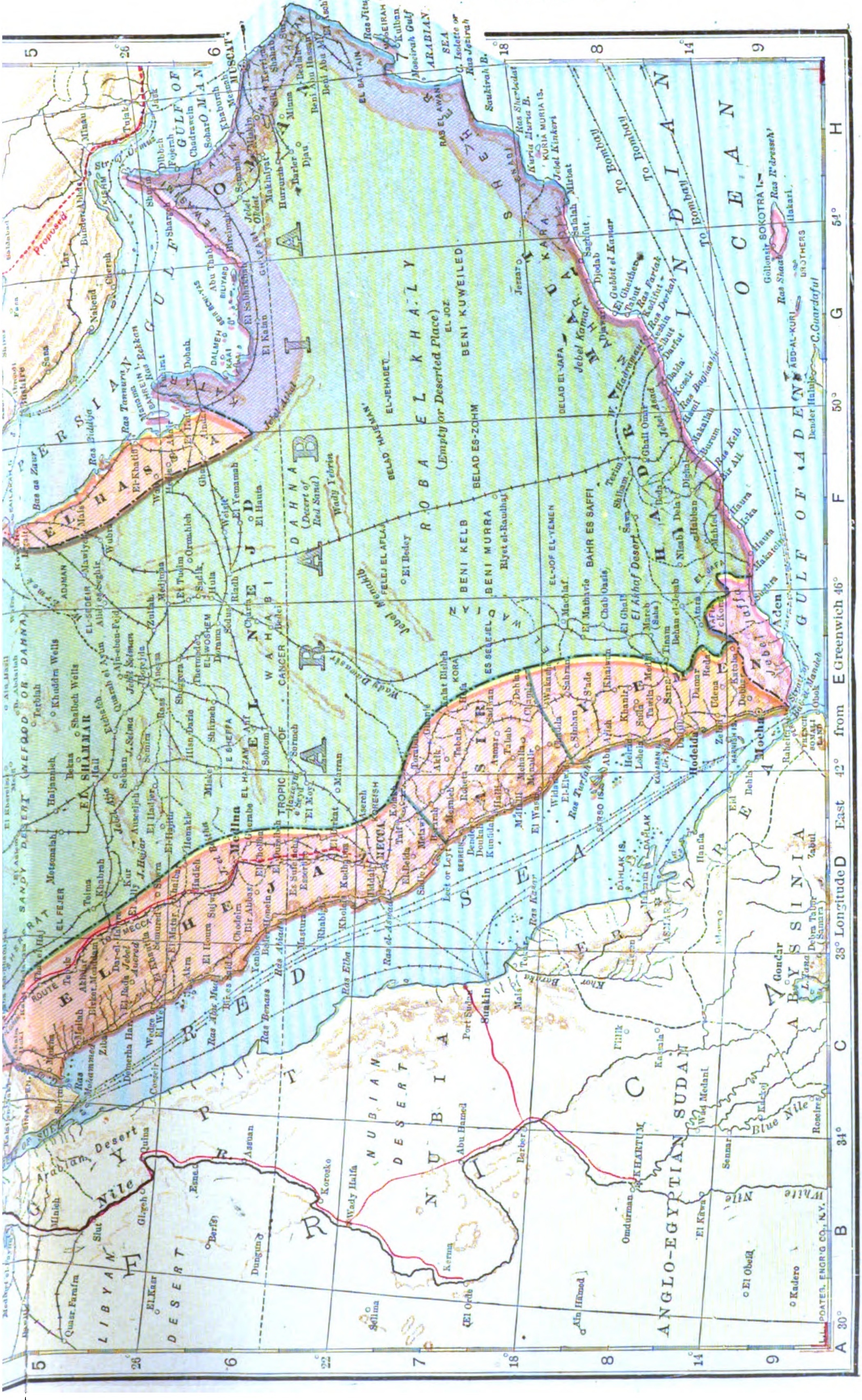
Education, formerly neglected, is now legally obligatory for children between 7 and 16, in state, parochial, or private schools. Elementary education is free. There are about 36,000 schools in the Empire, with an enrollment of about 1,330,000. The system is of recent development, and probably at least 75 per cent of the population is illiterate.

At Constantinople there is an Imperial University of five faculties—arts, theology, law, medicine, and science. There are also several Greek and Armenian colleges of high standing. Many foreign schools, some of collegiate rank, have been opened under American, English, and French auspices, missionary or philanthropic. The best known of these are Robert College and the American College for Girls at Constantinople, and the Syrian Protestant College at Beirut.

Ethnology. The Turkish Empire presents an extraordinary medley of nationalities. The ruling race, the Osmanli Turks, whose blood is greatly mixed with various foreign elements (Slavic, Greek, and Albanian in European Turkey), constitute a minority of the population even in the regions actually under the rule of the Sultan. The only section of the Empire in which they are numerically dominant is the interior of Asia Minor. The most important peoples in Asiatic Turkey after the Osmanlis are the Arabs (Syria, Mesopotamia, Arabia), Armenians (who are found in large numbers outside of Armenia), and Kurds. The Greeks and Jews (in addition to the Armenians) are important elements in the urban population of a large part of Asiatic Turkey. There are less than 1,000,000 persons of Turko-Tatar blood in Turkey in Europe, and these are chiefly in the portions nearest to Asia. The Turks form a large element in the population of Constantinople and Adrianople, in the interior of Thrace, and in parts of Macedonia. All the remainder of the population of European Turkey, with a small exception, is divided between Slavic peoples and those belonging to the Mediterranean race, chiefly Greeks in the south and east, and Albanians (Shkipetars) on the Adriatic. The Slavs of Turkey are of Serb and Bulgarian stock. There are a number of Wallachs (Rumans) in the southwest, who are known as Tsintsars. The Jews are numerous in Constantinople and Saloniki, and the Armenians are also well represented in the urban population of European Turkey.

History. In the first half of the thirteenth century, at the time of the Mongol invasions under Genghis Khan, a small body of Mohammedan Turks moved westward from their home in Iran and made their way to Asia Minor. Under the lead of Ertogrul, they entered the service of Ala-


TURKEY IN ASIA
AND
ARABIA
SCALE OF STATUTE MILES
0 50 100 200 300 400
SCALE OF KILOMETERS
0 100 200 300 400 500 600
Important towns are shown in heavy face type
Railways
Routes of travel
Telegraph lines and Cables
Capitals of Countries
Capitals of Vilayets
26° A 30° B 34° C 38° D 42° E 46° F 50° G 54° H 58° J 62°
BLACK SEA
CASPIAN SEA
MEDITERRANEAN SEA
RUSSIAN EMPIRE
PERSIA
ASIA MINOR
SYRIAN DESERT
(Badiet-esh-Sham)
SANDY DESERT (NEFOOD OR DANNA)
CAUCASUS
CONSTANTINOPLE
Trebizond
Erzerum
Tiflis
Baku
Teheran
Aleppo
Damascus
Beirut
Bagdad
Bassora
Mosul
Cairo
Alexandria
Jerusalem
CYPRUS
CRETE OR CANDIA
Smyrna
Konieh
Angora
Sivas
Diarbekr
Van
Tabriz
Ispahan
Kerman
Great Salt Steppe


A R A B I A
RED SEA
PERSIAN GULF
GULF OF OMAN
ARABIAN SEA
GULF OF ADEN
INDIAN OCEAN
E G Y P T
NUBIA
NUBIAN DESERT
LIBYAN DESERT
Arabian Desert
ERITREA
ABYSSINIA
ANGLO-EGYPTIAN SUDAN
EL HEJAZ
ASIR
YEMEN
HADRAMAUT
MAHRA
OMAN
EL HASA
EL NEJD
EL WAHABI
ROBA EL KHALY (Empty or Deserted Place)
DAHNA (Desert of Red Sand)
SANDY DESERT (NEFOOD OR DAHNA)
TROPIC OF CANCER
Mecca
Medina
Aden
Muscat
Mocha
Hodeida
Suakin
Port Sudan
Khartum
Omdurman
Berber
Wady Halfa
Assuan
SOKOTRA I.
C. Guardafui
Straits of Bab-el-Mandeb
Blue Nile
White Nile
Nile
To Bombay
Proposed
Longitude East from Greenwich
30° 34° 38° 42° 46° 50° 54°
A B C D E F G H
5 6 7 8 9
26° 22° 18° 14°
POATES. ENGR'G CO., N.Y.

ed-Din, the Sultan of Iconium (or of Rum, as the state was known to the Moslems), the last surviving remnant of the great Empire established by the Seljukian Turks in western Asia. Ala-ed-Din granted them some land in Phrygia. The son of Ertogrul, Osman or Othman (1288–1326), laid the foundations of the independent power of his tribe (to which his name became attached) on the ruins of the Seljuk dominion in Asia Minor. Osman's son and successor, Orkhan (1326–59), continued the aggressive policy of his father. He made Brusa, the ancient capital of Bithynia, which had been wrested from the Byzantines, his residence, and gained a foothold in Europe by the taking of Gallipoli (1354). Orkhan was the organizer of the Ottoman Power. He exacted a tribute of children from conquered Christian peoples, and these, reared as Mohammedans and trained under rigid military discipline, were organized into that efficient fighting machine, the Janizaries (q.v.). He was succeeded by Amurath I (1359–89), under whom the Ottoman realm became a European as well as an Asiatic Power. At this time, by the side of the declining Byzantine or Greek Empire, the Kingdom of Servia had risen to considerable power. Eastward to the Black Sea, south of the Danube, the Bulgarian czars held sway, and beyond the Danube the principalities of Moldavia and Wallachia had been struggling into existence. Venice and Genoa had extended their power and dominion into the eastern Mediterranean. Amurath I conquered Adrianople in 1361 and made it his capital. The Turks began to close in upon the Byzantine Empire, and the dominion of Constantinople was reduced to Thrace, Macedonia, and parts of Greece. Amurath greatly extended the Turkish dominions in Asia Minor, and in 1389 he broke the power of Servia in the bloody battle of Kossovo. The Sultan was struck down in the moment of victory and was succeeded by his son, Bajazet I (1389–1402). Bajazet began his reign with the conquest of Bulgaria and with a war against the Wallachs. A crusading army of Hungarians, Poles, and French, under the command of Sigismund, King of Hungary, was totally routed at Nicopolis in 1396. In 1402, Timur with his Mongol horde swept over Asia Minor, overthrew Bajazet at Angora, and carried him off a captive. On the fall of Bajazet (who died in 1403) there was a struggle for dominion between his sons, which lasted a decade. Finally, in 1413 the youngest son, Mohammed I, found himself in undisputed possession of the whole Empire. Amurath II (1421–51) extended the Turkish dominion over Macedonia, conquered part of Greece, waged fierce wars with the Hungarians, over whom he finally triumphed, and attacked the Albanians, although without success. The most memorable event of his reign was his victory over the Hungarians under King Ladislas III (q.v.) and Hunyady (q.v.) at Varna in 1444. Mohammed II (1451–81), the son of Amurath II, prepared immediately on his accession to effect the conquest of Constantinople. The city fell on May 29, 1453, and the Byzantine Empire was at an end. An offshoot from the Greek realm, the Empire of Trebizond, was conquered in 1461, and about the same time the Turks completed the conquest of the Morea. The seat of the Ottoman Empire was transferred from Adrianople to Constantinople. The Turks, merciless as they were towards their conquered foes, allowed the Christian churches to maintain their organization. In 1456 Mohammed II undertook the siege of Belgrade, the key to Hungary, but the city was delivered by the signal victory of Hunyady. A few years later Servia was incorporated into the Turkish Empire and Bosnia was subdued. In 1470 Negropont (Eubœa) was wrested from the Venetians and in 1475 the Tatar Khan of the Crimea became a vassal of the Ottoman Sultan. Albania, which under the lead of Scanderbeg had long heroically held out against the Turks, was at last subjugated. In 1480 the Knights of St. John successfully defended Rhodes against a Turkish attack. At this time the Turks obtained a momentary foothold in Italy by the conquest of Otranto. The reign of Bajazet II (1481–1512), the successor of Mohammed II, was uneventful, but under Selim I (1512–20) the tide of Ottoman conquest rolled irresistibly eastward and southward. He carried his arms successfully into Persia, conquered Syria (1516), annexed Egypt (1517), and assumed the guardianship of the sanctuary of Mecca, thus proclaiming himself the successor of the caliphs. At this time Moldavia became tributary to the Porte, a position to which the sister principality of Wallachia had been previously reduced.

At the close of Selim's reign the famous corsair Khair-ed-Din (Barbarossa), who ruled Algeria, placed himself under Turkish suzerainty. Under Solyman the Magnificent (1520–66) the Ottoman Empire stood at the height of its power and splendor. Belgrade was taken in 1521 and Rhodes was conquered in the following year. The victory over the army of Louis II of Hungary at Mohács in 1526 broke up the Hungarian realm. It was followed by a succession of campaigns against the Hapsburgs, in one of which (1529) Vienna itself was besieged, and which converted the heart of Hungary (including the capital, Buda) into a Turkish province. (See HUNGARY; SOLYMAN II.) Conquests were also made from Persia. On the Mediterranean Sea the Turks were the undisputed masters. Venice had been gradually stripped of her possessions in the Morea and the Archipelago. Tripoli became subject to Turkey in 1551. Towards the close of Solyman's reign in 1565, a vast Turkish force was beaten back by the heroic defenders of Malta. In the following year the little Hungarian fortress of Szizet long kept at bay the Turkish host which the Sultan had marshaled against the Austrians. Solyman died before the fortress fell. Selim II (1566–74) undertook to wrest Cyprus from the Venetians and this brought about a Holy League between Venice, Spain, and the Pope, whose fleets inflicted a crushing defeat upon the Turks in the battle of Lepanto (1571). Cyprus, nevertheless, was taken by the Turks. In the reign of Selim II the subjugation of Yemen was completed, and about the time of his death the Spaniards were driven from Tunis, which became subject to Turkey.

With the disaster at Lepanto the decline of the Ottoman Power began. Under Amurath III (1574–95) a war with Persia, in which conquests were made in Armenia, was followed by a contest with Austria, which continued under Mohammed III (1595–1603) and extended into the reign of Achmet or Ahmed I (1603–17). At this time Persia rose to a high pitch of power under Abbas the Great, who in 1605 won a great victory over the Turks at Basra, and who wrested large territories from them, even making himself master of Bagdad (1623). The cruel but able and energetic Amurath IV (1623–40) restored the fortunes of Turkey in the East, retaking Bagdad in 1638. After his death maladministration and internal disorders hastened the decadence of the Empire. In 1656 the Venetians, on whom the Turks had made war for the possession of Crete, appeared in the Dardanelles and defeated the Turkish fleet. The realm was raised for a brief period from this state of depression by the abilities of Mohammed Kiuprili and his son Ahmed (see KIUPRILI), who successively held the position of Grand Vizier during part of the reign of Mohammed IV (1648–87). They infused fresh vigor into the administration and to some extent enabled the Turkish arms to reassert themselves. A war with Austria, in which the Turks finally suffered a great defeat at the hands of Montecuccoli at St. Gotthard, on the banks of the Raab (1664), was terminated by a peace slightly advantageous to Turkey. In 1669 the fortress of Candia fell and Venetian rule in Crete came to an end. In the regions to the north of the Black Sea the Turks fought with varying success against the Poles, and it was in the reign of Mohammed IV that they first came in collision with the rising power of Russia, whose Czar, Feodor II, came off victorious in the conflict. In 1683 the Porte took up the cause of Tökölyi, the leader of the Hungarians in their rising against Leopold I of Austria, and once more the tide of Moslem invasion rolled up to the gates of Vienna. Kara Mustapha (q.v.), the successor of Ahmed Kiuprili, advanced with a vast army and laid siege to the Hapsburg capital. For a moment the fate of central Europe hung in the balance, but after the siege had lasted two months, the chivalry of Poland, led by King John Sobieski, and a German army came to the relief of the city, and on September 12 the Turkish army was put to flight in a great battle before its walls. The blow was a crushing one and ended the rôle of Turkey as a formidable aggressive power. Austria, Poland, and Venice now made a great onslaught upon the Ottoman Empire. The Austrians drove the Turks before them in Hungary, capturing city after city. In 1686 Buda, over whose walls the crescent had been displayed for a century and a half, fell into their hands. At the same time John Sobieski overran Moldavia and Wallachia and the Venetians successfully invaded the Morea. In 1695 Peter the Great took up arms against the Turks and in 1696 he wrested Azov from them. The Austrians, under Prince Eugène (q.v.), annihilated the Turkish army opposed to them at Zenta in 1697. In the Peace of Karlowitz in 1699, Turkey was forced to give up all of Hungary between the Danube and the Theiss, to restore to Poland a great part of the Ukraine, acquired in 1672, and to surrender the Morea to the Venetians. In the course of the seventeenth century Turkey had been gradually tightening her hold on Moldavia and Wallachia, which early in the following century were placed under the rule of Fanariot hospodars, appointed by the Porte.

In 1711 Sultan Achmet III took up arms for Charles XII of Sweden against Peter the Great of Russia, who had triumphed over his rival at Poltava (1709). The Czar invaded Moldavia, where he was hemmed in by the Turks on the banks of the Pruth, and was glad to purchase peace by the surrender of Azov. In 1715 the Turks reconquered the Morea from the Venetians. The struggle with Austria was renewed in 1716. The Austrian forces under Prince Eugène gained a great victory in the same year at Peterwardein and another in 1717 at Belgrade, which they captured. In the Peace of Passarowitz (1718) the Turks were compelled to cede the Banat, part of Servia (with Belgrade), and parts of Bosnia and Wallachia to Austria. The Morea remained in their hands. In 1736 Russia entered upon her rôle as a great assailant of the Ottoman Empire with the seizing of Azov and the invasion of the Crimea, which were followed by the capture of Otchakov (1737), and a victorious advance into Bessarabia and Moldavia. Austria joined Russia in 1737; but a scheme for the partition of Turkey between the two Powers was foiled by the defeats inflicted upon the Austrian armies by the Turks. In the Peace of Belgrade in 1739 Austria relinquished the Servian and Wallachian territories acquired in 1718, while Russia concluded a peace in which she gained but little. Alarmed at the aggressive intervention of the Empress Catharine II in the affairs of Poland and believing the safety of his realm to be endangered by Russian intrigues, Sultan Mustapha III ventured in 1768 on a war with Russia, which proved disastrous to Turkey. The Russians advanced victoriously through Moldavia and Wallachia, defeated the Tatar Khan of the Crimea (the vassal of the Sultan), won a victory on the Kagal (in Bessarabia), stormed Bender, broke into the Crimea, and in 1773–74 advanced into Bulgaria, where, however, the Turkish fortresses withstood their attacks. In 1770 the Russians burned the Turkish fleet at Tchesme. Peace was concluded at Kutchuk-Kainardji in 1774, Turkey renouncing her suzerainty over the Crimea and other Tatar territories in the region of the Black Sea, and according to Russia a sort of protectorate over Moldavia and Wallachia and the free navigation of the Turkish waters. During this war Turkey was to a certain extent crippled by the revolt of the Mameluke Governor of Egypt, Ali Bey (q.v.). In 1787 Sultan Abdul Hamid I plunged Turkey into a fresh war with Russia. Joseph II of Austria seized the opportunity to make a sudden onslaught on the Turkish territories, and fresh disasters befell the Ottoman arms. Potemkin stormed Otchakov (1788); the allies won a great victory at Fokshani (1789); Belgrade and Bender were captured in the same year; and Ismail was stormed by Suvarov at the close of 1790, the Russians enacting a carnival of blood. Austria, through pressure from Prussia, withdrew from the struggle in 1791 without reaping any benefit from it, and Catharine II in 1792 concluded the Peace of Jassy with Sultan Selim III, which made the Dniester the boundary between the Muscovite and Ottoman dominions. Rent by internal disorders, Turkey was unable to offer resistance when Bonaparte in 1798 suddenly swooped down upon Egypt, which, under its Mameluke beys, was already almost severed from the Empire. In Syria the advance of the French was stayed by the brave defenders of Acre (1799). Bonaparte returned to France, and in 1801 the English drove the French from Egypt. The downtrodden Servians rose in insurrection in 1804 under the leadership of Czerny George.

Selim III, under the influence of French thought, had conceived extensive ideas of reform, which he endeavored to put in operation when he ascended the throne. Many of his innovations were premature and he aroused the anger of the Janizaries by his attempts at military reorganization. A revolt forced Selim to abdicate in 1807, and placed his nephew, Mustapha IV (1807–08), on the throne. Mustapha was soon deposed and Mahmud II (1808–39) was made Sultan. A war begun by Russia in 1806 was terminated by the Treaty of Bucharest in 1812, by which the country between the Dniester and the Pruth was ceded to Russia. The authority of the Sultan was reëstablished in Servia, but the people rose again under Milosh Obrenovitch and achieved a partial independence. Greece threw off the Turkish yoke in 1822 and after an heroic struggle secured its independence through the armed intervention of the European Powers in 1827–29. A revolt of the Janizaries in 1825 was successfully met by Mahmud; in 1826 thousands of the famous corps were slain, and the organization was abolished. Russia waged a successful war against Turkey in 1828–29. General Diebitsch advanced as far as Adrianople, and Paskevitch was equally successful in Armenia. In the Peace of Adrianople (1829) Turkey surrendered to Russia the northeastern coast land of the Black Sea and transferred to her the suzerainty over the tribes of the Caucasus; Russia was accorded a regular protectorate over Wallachia and Moldavia, which for a time were reduced to the position of Russian dependencies. Mehemet Ali, Viceroy of Egypt, who had raised himself to an almost independent position, made war in 1831 on his liege lord, the Sultan. The victories of Ibrahim Pasha (1832) secured to the Egyptian ruler the possession of Syria and Cilicia, while Russia took advantage of the desperate state of Turkey to force upon the Sultan the Treaty of Unkiar Skelessi (1833), which closed the Black Sea to the vessels of war of all nations save Russia. In 1839 Mahmud II made war upon Mehemet Ali. The Turkish army was utterly defeated by Ibrahim Pasha at Nisib (June 24, 1839), and soon after the the Turkish fleet was treacherously delivered up to the Egyptians. Only the intervention of the Quadruple Alliance (q.v.) in 1840 prevented the downfall of the Turkish Power. Mehemet Ali was forced to relinquish Syria and other territories; he was recognized as hereditary, though tributary, ruler of Egypt. Soon after the beginning of this war Mahmud II died (July 1, 1839). His son, Abdul-Medjid (1839–61), continued the reforms commenced in the preceding reign. Russia's truculent attitude brought on a war with Turkey in 1853, in which that country would have suffered severely but for the effective intervention in 1854 of England and France, soon joined by Sardinia, all bent on humbling Russia. The allies of the Sultan made the Crimea the scene of their land operations, and in 1855 Sebastopol fell. (See CRIMEAN WAR.) The Treaty of Paris (1856) restored to Turkey the command of both sides of the lower Danube, excluded the Czar from his assumed protectorate over the Danubian principalities (Wallachia and Moldavia), and closed the Black Sea against all ships of war. Wallachia and Moldavia secured almost complete independence and were soon united into the Principality of Rumania. The Porte, adopted into the family of European nations, made a proclamation of equal civil rights to all races and creeds in the Turkish dominions. A massacre of Christians in the Lebanon and at Damascus (see DRUSES) provoked Western intervention in 1860. Abdul-Medjid was succeeded by his brother Abdul-Aziz (1861–76).

The Treaty of Paris in 1856 was supposed to have settled the Eastern question (q.v.) by guaranteeing Turkey's integrity, but Russia was merely awaiting an opportunity to press its old policy, and in 1871 the Russian government seized the opportunity of war between Germany and France to declare that it felt itself no longer bound by that provision of the Paris treaty which forbade Russia to have a fleet in the Black Sea. A London conference sanctioned this stroke of Russian diplomacy. An insurrection in Crete in 1866–68 was suppressed with difficulty. Between 1854 and 1871 the Turkish debt had increased by nearly $600,000,000; and in 1875 the Porte was driven to partial repudiation of its obligations. An insurrection which broke out in Herzegovina in 1875 served to stir up all the neighboring Slavic peoples and was skillfully encouraged by Russian emissaries. In May, 1876, frightful massacres of Christians in Bulgaria took place. At the close of that month Abdul-Aziz was deposed and soon after was found dead. His nephew, Amurath or Murad V, son of Abdul-Medjid, reigned only three months, when he was deposed as an imbecile, and his brother, Abdul-Hamid II, succeeded to the throne. In July, 1876, Servia and Montenegro declared war against the Porte. Before the end of the year the Servians were utterly defeated, in spite of the help of many Russian volunteers. The state of affairs in the Turkish provinces seemed to call for a conference of the Great Powers at Constantinople. The proposals then made for the better government of the Christian subjects of Turkey were rejected by the Grand Council of the Turkish Empire. Simultaneously, however, with the assembly of the conference the Turkish government had taken the extraordinary step of bestowing a parliamentary constitution on the Ottoman Empire. The Parliament assembled in March, 1877, but this ostensible remodeling of the political fabric of the Empire did not get beyond its incipiency. Russia took it upon herself to enforce on Turkey the demands made by the Powers, and on April 24, 1877, declared war. (See RUSSO-TURKISH WAR.) The Turks made a brave stand, but at last succumbed, and at the close of January, 1878, the Russians, aided by the Rumanians, were almost before the walls of Constantinople. The Treaty of San Stefano was signed on March 3, but the European Powers intervened and readjusted the whole Eastern question at the Congress of Berlin, Russia being forced to content herself with a much less radical disruption of the Turkish Empire in Europe than she had sought to bring about. See BERLIN, CONGRESS OF.

For a few years under the settlement effected at Berlin, there was comparative quiet in the Ottoman dominions, although in 1883, in consequence of disturbances in Egypt, and the bad condition of the finances in that province, Great Britain established a control there which practically nullified what little was left of the Ottoman sovereignty. Following on a revolutionary movement at Philippopolis in September, 1885, the Prince of Bulgaria proclaimed the annexation of eastern Rumelia, and after a decade the Porte was compelled to recognize the change which thus deprived it of its fairest province. In 1895–96 there were massacres of tens of thousands of Armenian Christians, which were connived at by the local officials of the Ottoman government. The protests of Europe were of no avail, because Abdul-Hamid knew well how to play off the Powers against one another so as to prevent interference of an effective kind. A rising of the Christians against the Mohammedans in Crete (q.v.) followed in 1896, and was the signal for the outbreak of long-repressed hostilities in Greece, which recklessly entered upon war with Turkey in April, 1897. The campaign of a few weeks showed the utter futility of the Greek preparations. (See GREECE.) Greece was forced to sue for peace, the terms of which provided for the payment to the Ottoman government of an indemnity of $18,000,000, and the rectification of the Greco-Turkish frontier in favor of Turkey. Crete was taken in charge by Great Britain, Russia, France, and Italy, and a settlement was made in 1898 by which the suzerainty of Turkey was renewed, but the island was given an autonomous government for three years, its executive head being Prince George of Greece, as High Commissioner of the four Powers. This settlement was renewed indefinitely upon its expiration in December, 1901. See CRETE.

The Ottoman Empire in the first decade of the twentieth century seemed on the point of collapse. Arabia was in constant revolt. Anarchy reigned in Albania, where the Sultan's officials found it all but impossible to enforce law or to collect taxes. Worst of all was the ferment in Macedonia, where Greeks, Servians, and Bulgarians were carrying on rival nationalist agitations and with their filibustering exploits were keeping the district in turmoil. An especially vigorous Macedonian upheaval, precipitated by the Bulgarians in 1903 and attended by massacres on the part of the Turks, led to foreign intervention; and the Sultan reluctantly consented to new reform schemes, which, however, were never fully executed. Meanwhile the public debt was steadily increasing; railways, mines, and banks were falling into the hands of foreign capitalists; the Balkan nations and the Great Powers of Europe were greedily regarding the Ottoman provinces.

The "Sick Man of Europe," as Turkey had so often been called, was apparently tottering to his end. At this point, however, appeared the "Young Turks," a group of politicians and patriots, many of whom had studied in the universities of western Europe, who dared dream of rejuvenating their country. The Young Turks would win parliamentary government for their homeland. In education, in science, in industry, Turkey would be transformed into a progressive state, vying with other European nations. Above all, they would induce their compatriots to forget religious differences in a spirit of national patriotism. The Young Turk movement was a counterpart in Turkey to the nationalist agitations which had already created a Greece, a Servia, a Rumania, and a Bulgaria. Shrewdly enough, the leaders of the movement avoided all violence until they were absolutely sure that the army would support them. Then, on July 23, 1908, their central body, the so-called Committee of Union and Progress, with Enver Pasha at its head, proclaimed at Saloniki the restoration of the constitution of 1876. Two army corps at once threatened to march on Constantinople; and the terrified Abdul-Hamid hastily issued an imperial decree, officially restoring parliamentary government. A few opponents of the coup d'état were assassinated, the press was emancipated, a Liberal statesman, Kiamil Pasha, was appointed Grand Vizier, and Turkey was a constitutional monarchy. Taking advantage of this disturbance in the Ottoman Empire, Austria-Hungary in October, 1908, formally annexed Bosnia and Herzegovina, and simultaneously Ferdinand of Bulgaria proclaimed the complete independence of his state (including eastern Rumelia) and assumed the title of "king." Helplessly but slowly the new Turkish government acquiesced in what it could not prevent and in 1909, in return for financial indemnities, recognized Bulgarian independence and the Austro-Hungarian annexation of Bosnia-Herzegovina as accomplished facts. To make matters worse for the constitutional government of Kiamil Pasha, Albania became more turbulent in the spring of 1909, mutiny broke out in Arabia, and the quarrels of rival nationalities in Macedonia became more acute. Under these circumstances, a counter revolution against the Young Turks was set on foot in Constantinople and received the approbation of Sultan Abdul-Hamid II. The Committee of Union and Progress, installed in Saloniki, responded promptly by sending an army under Shevket Pasha against Constantinople. After less than a day's fighting Shevket Pasha was in command of the capital (April 25, 1909). At the behest of the triumphant Young Turks, the Parliament, now calling itself a national assembly, deposed Abdul-Hamid, placed him under surveillance near Saloniki, and chose in his stead his brother, Mohammed V.

The new parliamentary régime, under Young Turk influence, proceeded forthwith to make the Turkish language official, to standardize education, to plant Moslem colonies in Macedonia, to utilize violence and bribery in elections, to forbid public meetings, to repress anti-Ottoman agitation, to disarm the Macedonian Christian villagers—in a word, to attempt the "Ottomanizing" of the Turkish Empire. Resentfully the Bulgarians, Greeks, and Servians in Macedonia regarded the new tendency, and, putting aside their own quarrels, they now made common cause against the Turk. Greece, Bulgaria, and Servia began to draw more closely together with the object of protecting the Christians in Macedonia.

Meanwhile the Turco-Italian War (q.v.) caused discomfiture in Constantinople. On Sept. 28, 1911, Italy announced her intention of seizing Tripoli and Cyrenaica. The war that followed was confined mostly to irregular but fierce hostilities between the Italian expeditionary armies on the one hand, and, on the other, the Turkish garrisons and Arab tribesmen in Africa. During the course of the war, Italy occupied 12 of the Ægean Islands, and, when peace was finally concluded (October, 1912), Italy not only gained the vilayets of Tripoli and Cyrenaica, but in addition acquired the right to hold the 12 Ægean Islands should Turkey fail to grant to their inhabitants full amnesty, local autonomy, and public liberty. During the summer of 1912, while Turkey was still harassed and weakened by the war with Italy, the Balkan states concluded treaties of alliance and began to press more vigorously for radical reforms in Macedonia, and at the same time mutinous outbreaks occurred in Albania. In October, 1912, Bulgaria, Greece, Servia, and Montenegro mobilized their armies and presented joint ultimatums to the Porte demanding autonomy for Macedonia under European governors. Despite the efforts of the Great Powers to avert hostilities, the peremptory refusal of the Turkish government to comply with the ultimatums precipitated the war which lasted from October, 1912, to September, 1913. (See BALKAN WAR.) The outcome of the struggle was the loss of all Turkish possessions in Europe except Constantinople, Adrianople, and a little adjacent territory.

In the middle of the nineteenth century Great Britain and France had labored to bolster up the Ottoman Empire and to safeguard it against possible Russian aggression. By the time of the Balkan War, however, British and French interests in the Levant appeared to be menaced less by Russia than by Austria-Hungary and Germany. The latter Powers were working hand in glove: Germans were arming and drilling the Turkish army and securing the major share of new concessions in the Ottoman Empire, notably the Bagdad Railway, while Austria-Hungary was curbing the Servians and increasing her political and economic influence in Macedonia. In the course of the Balkan War, therefore, France and Great Britain, in conjunction with Russia, tended, on the whole, to sympathize with the Balkan states against Turkey. Accordingly, to the student of international politics it was not particularly surprising that soon after the outbreak of the Great War of 1914 between Russia, France, Great Britain, and Servia on one side, and Austria-Hungary and Germany on the other, the Turkish government should throw in its lot with the latter combination. Undoubtedly the Young Turk leaders believed that if they were quite unable to recover what had recently been wrested from them in Europe they might at least, through Teutonic support, maintain Ottoman sovereignty over Egypt and extend Turkish frontiers into Persia at the eventual expense of Russia and Great Britain. See WAR IN EUROPE.

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TURKEY (abbrev. of *Turkey cock*, *Turkey hen*, so called as being supposed to come from Turkey, vaguely applied to Tartary or Asia in general). The turkeys are natives of North and Central America, and the only two species known are the common wild turkey (*Meleagris gallopavo*), divided into five subspecies, and the beautiful Yucatan turkey (*Meleagris ocellatus*). They were once regarded as a distinct family, but are now considered the sole American representatives of the Phasianidæ. The wild turkey is like the domesticated one, but more brightly colored. The ocellated turkey of Central America is a smaller and more beautiful species; the plumage is lustrous, and parts of it are ocellated, like the peacock's feathers; the bare head is blue with orange caruncles. This fine species is confined to Yucatan and Central America. The common wild turkey is still found in Mexico, Texas, and Arizona, and in other parts of the West and South, but is scarce east of the Mississippi and north of Virginia or Kentucky, though it formerly ranged well up into New England and as far north as Ontario. The wild turkey nests on the ground, commonly laying about 12 eggs of a creamy-white color. The female rarely raises more than one brood in a season and then only if misfortune has come to the first brood. The young are at the mercy of many enemies and the adults that survive have become nearly exterminated in America.

The domestic turkey, the largest of gallinaceous birds, appears to have been introduced into Europe by the Spaniards early in the sixteenth century and is the descendant of the Mexican wild turkey. The domestic birds vary greatly in plumage from the tints of the wild species to buff, or brown, or pure white, and occasionally produce a crest. On account of its size and the excellence of its flesh and eggs the turkey is one of the most valued kinds of poultry. The management of turkeys differs little from that of the common fowl. The young are tender for the first few weeks, and require care, particularly to keep them from getting wet by running among the wet grass, or the like; but afterward they are sufficiently hardy. Consult American School of Poultry Husbandry, *Turkeys, Waterfowl, and Guineas* (Mountain Grove, Mo., 1914), and E. A. McIlhenny, *The Wild Turkey and its Hunting* (Garden City, N. Y., 1914). See Colored Plate of PEACOCK, TURKEY, AND GUINEA FOWL.

TURKEY BUZZARD. See VULTURE.

TURKEY GNAT. An insect (*Simulium pictipes*) of the dipterous family Simuliidæ, identical with the Southern buffalo gnat, which usually makes its appearance about the time turkeys are setting, and sometimes causes great mortality among those birds. See BLACK FLY; BUFFALO GNAT.

TURKEY GUM. See GUMS.

TURKEY RED. A name applied to one of the most durable and beautiful colors which have been produced on cotton. The process of dyeing cotton Turkey red is said to have been practiced in India from ancient times. The operations are long and tedious, and their effect could scarcely be explained theoretically. Turkey red is one of the colors of alizarin which can be obtained either from the madder root (*Rubia tinctorum*) or by an artificial process of manufacture as a product of coal tar. See ALIZARIN.

TURKEY STONE. A honestone found in Turkey. See HONES.

TURKISH LANGUAGE AND LITERATURE. The language and literature of the Turks in general, and especially of the Osmanli. Within the Ural Altaic family the Turkish group stands somewhat nearer to the Samoyedic and Finno-Ugric than to the Tungusian and Mongolian. While the pronouns, case suffixes, and construction of sentences are very similar to those in the latter groups, not only is there a very marked difference in the vocabulary, but also a more developed system of inflection and a freer use of pronominal suffixes. On the other hand, the Turkish group has a simpler system of cases than the Samoyedic and Finno-Ugric; it does not incorporate, as they do, the pronominal object in the verb, and it inserts, as they do not, the negative after the root of the verb. It is, on the whole, more agglutinative and less inflectional than the Finnish and the Hungarian.

Among the languages or dialects comprised within the Turkish group the Osmanli has the closest affinities to the Anadoli, the Krimmi, the Azerbaijani, and the Turkmani, though the latter two already begin to show characteristic differences. The Jagatai and Taranji, and even more the northern dialects, Kirghiz, Bashkir, Irtysh, and Volga in the West, and Altai, Baraba, Lebed, Tuba, Abakan, Kuarik, Soyon Karagass, and Uighur in the East, have a much broader and harsher vocalization, a very confusing substitution of consonants, as *m* for *b*, *b* for *w*, *j* for *y*, etc., and a preservation of those ancient tense and case words which in Osmanli and some of the other southwestern dialects have become mere arbitrary particles added to the root to indicate tense or case.

TURKISH LANGUAGE

The chief structural characteristics of the Turkish language are four: (1) the root of every word is inviolable; (2) the root is emphasized by making its leading vowel dominate the vowels and to some extent the consonants added for purposes of inflection, subjecting them to change under regular rules of euphonic harmony. (3) Grammatical forms, especially in the conjugation of the verb, are abundant, regular, logical, and efficient. (4) Determining or modifying syllables are placed at the end of the root. The Turkish verb begins in simplicity. For instance, *bak* means look thou, and is the root of the verb *bakmak*, to look. Upon this root a series of new verbs may be built: (1) Causative: *bakdirmak*, to cause or allow to look; (2) reciprocal: *bakishmak*, to look at one another; (3) reflexive: *bakinmak*, to look at one's self, i.e., to be perplexed. From these again a further series of new verbs can be made by inserting in each the causative particle; (4) *bakdirtmak*, to make or let one cause another to look; (5) *bakishdirmak*, to cause or allow one to look at another; (6) *bakindirmak*, to cause or allow one to look at himself, i.e., to be perplexed. All of these new verbs can be conjugated in the positive, the negative, and the impossible form (to look; not to look; and not to be able to look), and, if the sense permits, in all the moods and tenses of the active and passive voices. The same is true of the root of every verb in the language, if the sense permits. It has been computed that, counting all the moods and tenses and numbers and persons, the permutations of which each Turkish verb is capable amounts to over 25,000. Yet so simple and clear are the rules that the memorizing of 44 syllables or particles enables one to build and understand the whole series. The efficiency of the system appears on realizing that Turkish grammar has but one conjugation and no irregular verbs except the auxiliary. The scheme of the verb is that of a form which will fit every root and which is yet so transparent that the root is always visible. The same principle of agglutination to the root is followed in making new verbs from nouns or adjectives and in declining nouns and pronouns. There is no gender for noun, pronoun, or adjective. Adjectives are subjected to no change except for comparison. The Turkish syntax is peculiar. The unit of expression is the paragraph, and there is no punctuation. The subject of the ruling verb is placed as near as possible to the beginning of the paragraph. All subordinate sentences and clauses adding particulars have their verbs in participial form, the sense being thus suspended during the process of building the paragraph, until the chief verb coming in at the very end illuminates the whole.

The earliest form of the alphabet used in writing Turkish dialects is that employed in the inscriptions found on the Yenesei and on the Orkhon River south of Lake Baikal. The letters show a marked similarity to the Aramaic alphabet appearing on the later Arsacid coins. One of these inscriptions is dated in 733 A.D.; but it is not improbable that some of them are still earlier. The Uighur inscriptions are somewhat later; a copy of the poem *Kudatku Bilik*, "The Blessed Knowledge," was made in 1065. These Uighurs used an alphabet of 14 letters derived from the Nestorian Syriac. The same resemblance to the Estrangelo is also characteristic of the recently discovered Manichæan texts (cf. Le Coq, in *Journal of the Royal Asiatic Society*, London, 1911, pp. 277 ff.), and in a modified form this alphabet seems to have passed to the Tunguses and the Mongolians. As the Turkish tribes became Moslems they adopted the Arabic alphabet, increasing the 28 letters to 33 by the device invented by the Persians of adding dots to five of the Arabic letters. This alphabet is quite unsuited to the Turkish language, owing to the lack of proper vowels. As vowels like ä, ö, ü cannot be expressed, it is sometimes impossible to avoid serious ambiguity or uncertainty as to the meaning. Turkish is occasionally written in Armenian, Greek, or Russian letters.

The onrush of the Turks from the Far East into all civilized lands, including China, which continued from the tenth century to the end of the seventeenth, enlarged the meagre Turkish vocabulary. The tribes which invaded India, now known under the name of Moguls, lost their language; but those which conquered Persia and overthrew the Byzantine Empire came under the literary influence of Persian at first, then of Arabic, and finally of Greek and the European languages. The consequence was that the Ottoman Turkish (Osmanli), as the Western branch of the language is called, adopted into its literary vocabulary Persian words of poetry and history, Arabic words for religious and legal writings, Greek words for the winds and currents and fishes of the sea, Italian words for all that relates to sailing vessels, and, later, English terms for steam, the steamboat and its manœuvres, and French words for many of the terms of diplomacy.

TURKISH LITERATURE

Turkish literature is a term which at present implies the literature of the Western or Ottoman Turkish language. It may be regarded as falling into three periods: (1) The early period, when writers were from the region of Central Asia, and when the Persian was the model and often the instrument of their highest expression. (2) The middle period, beginning about the middle of the sixteenth century and extending well into the nineteenth, when Arabic dominated the Turkish literary world, having replaced Persian as model except in poetry. (3) The modern period, dating from about the time of the Crimean War (1853–56). In it the tendency of Turkish writers is to copy French, rather than either Persian or Arabian models, and to bring back into the language half-forgotten Turkish expressions.

The earliest literary remains of Turkish writers are the inscriptions mentioned above, deciphered and interpreted by Castrén, Thomsen, Radloff, Donner, and Hirth. One of the earliest books of the early period, celebrated for its pure Turkish, is a genealogical history of the Tatars by Abul Ghazi of Khwarezm, dating from the twelfth century. The judge Burhan el din of Sivas, a descendant of Genghis Khan, an adventurer, ruling over two provinces, who lost his life in trying to conquer another in 1398, has left some poems written in good Turkish, although after the Persian school. Another of the early poets was Suleiman Effendi (died 1410), chaplain to Sultan Bajazet, whom Timur carried off. He wrote a poem in honor of the birth of the Prophet Mohammed which has been read throughout Turkey on public occasions in each year during nearly 500 years, and still retains its power to move its hearers. Another of the poets of the early period was Amud el din, who wrote under the name Nesimi. Like the others of these early poets, he was under the influence of Sufiism (q.v.), and so incensed the more orthodox Moslems that he was flayed alive at Aleppo in 1417. Sheikhi, whose real name was Sinan (died 1420), was a doctor as well as a poet. His fame rests mainly upon his poem, the *Khar-namè*, or Donkey Book, in which he classifies his enemies according to the different types of asses found in the East.

Nevayi, whose real name was Ali Shir (died 1500), is the great representative of Turkish poetry in this period. He was Grand Vizier for a time to Sultan Husain of Herat, but retired early that he might write. He was a master in both Turkish and Persian. The thoroughly human quality of his writings appeared from the fact that one main source of our knowledge of the old eastern Turkish language is a dictionary written by a Persian in order that Persians might profit by Nevayi's writings. The greatest prose writer of this period was Baber, great-grandson of Timur, and "Mogul" conqueror of India in 1525–26. His annals of his campaigns are written in plain Turkish, Arabic and Persian words being used to eke out his vocabulary.

Of the middle period of Turkish literature Saad el din (died 1599) offers a type. He was a warrior of great renown, and afterward Chief Justice of the Turkish Empire (Sheikh al Islam) under Sultan Mohammed III. The work on which his literary fame rests is a history of the Ottoman Empire, called *Taj el Tevarikh*. The style is of the most ornate Persian order and there is hardly any Turkish in the book except those auxiliaries essential to the binding of the sentences. Saad el din followed the principle, which ruled literature throughout the middle period, that Arabic words must be brought into Turkish with all their grammatical rules and appurtenances. The effect is to make the finest Turkish literature of this period quite unintelligible to those who have not enough knowledge of Arabic and Persian to use dictionaries of those languages. Baki (died 1599), rated by Turkish critics as the "king of the poets of Osmanli Turkish," was a contemporary of Saad el din. He was the son of a mosque servant who became one of the Caziaskers, or judges of the supreme court, under Sultan Selim II. His poetry was strongly Persian in flavor, but without slavish imitation. Another great poet of this time was Fuzuli (died 1563), whose real name was Mehemed, of Bagdad. To a foreign taste he offers more of originality than Baki. His poems are warm with the peculiar fire of Sufiism, and in both poetry and prose he loved the strong virile Turkish words. The list of Turkish poets is long, but those mentioned are still the greatest names. To them we may add Nedim (died 1725), whose ghazels and kasidas show originality as well as eloquence of diction and humor. The name of Kiani, whose real name was Abu Bekr (died 1791), too, should have a place in the list of notable poets of this period. The simplicity and transparent beauty of his lines are such that had it not been for his inveterate waggishness he would hold very high rank among the Turkish poets. Another of the great poets of this period was

Nabi (died 1712), whose *Ghazels* are accounted among the finest. His real name was Yusuf of Urfa. One of his longer poems, the *Khairiyè*, has been translated into French by Pavet de Courteille. Sheikh Ghalib (died 1798), whose *Huan-u-ashk* (Beauty and Love) is regarded as a fine allegory, should also be mentioned, as well as the poetess Sherif Hanum, who died in 1809, leaving a *Divan* of some merit.

The historians of the middle period make a long list. But their work is blemished, as a rule, by a difficult, stilted style, and the pettiness of the annalist. Among exceptions in the long series we may select Pechevi Ibrahim, who shows some inkling of what a historian should be; Solak Zadè, who died about 1680, and wrote in the graphic style of an eyewitness; and especially Katib Tchelebi, sometimes called Hajji Khalfah (q.v.). His real name was Mustafa, and he died in 1658, leaving an enormous mass of extremely valuable writings in history, geography, and bibliography.

To the same period probably belong certain writings of value which are passed over in scorn by the Turkish literary critics because they are not in the mongrel language of the pedants. Hence their authors are unknown. Of this class is the *History of the Forty Viziers*, dedicated to Sultan Mustapha I (1617–23). It is a cycle of some 75 stories grouped about an incident of the Joseph and Potiphar order. The book is directed against the idea of trusting the fair sex and winds up, after all wrongs have been righted, with the quaint prayer, "May the Most High bring us all near to the good and to God, and keep us from the tricks of deceitful woman. Amen." Another of these unconsidered classics of Turkish is the *Life* of Nasr el din Hoja, a collection of bulls acted or spoken by a Turk of Asia Minor, who is delightfully humorous. To the same class belongs the story of *Shah Miran*, a collection of fairy tales, religious in purpose, which is remarkable for its pure Turkish diction.

As a fruit of the Crimean War a revolution took place in the educational system of Turkey. The result has been the appearance of the modern school of writers who are yet to change entirely the character of Turkish literature. The heavy scholastic theologians are seeking to arrest the movement by the censorship, and they have persecuted or imprisoned some of the most powerful writers, like Ebuzzia Tewfik, or sent them to die in exile on a barren island like Kemal Bey. The aim of the new school of writers is to free the Turkish language from the incubus of Arabic grammatical purism. The writers who have perhaps done the most towards accomplishing this object are Ahmed Vefik Pasha (died 1893), whose dictionary of Turkish in two volumes was a revelation to multitudes, and Ahmed Mithad Effendi, noted for his novels, essays, and historical studies. Great as is the linguistic value of Ahmed Mithad's writings, they are too close imitations of French works to have permanent literary value. Of far greater weight was Kemal Bey, who died in 1878. Jevdet Pasha, illustrious as an historian, whose works show a steady development towards the simpler Turkish style; Ziya Pasha, a brilliant essayist and poet; and Jevad Pasha, who has written a fine history of the origins of the Turkish military organization, are other examples of this school. Other notable names of this period are Muallim Naji, poet and essayist; Ebuzzia Tewfik, literary critic; Sezayi Bey, Husain, Rahmi, Ahmed Rasim, and Aliyè Hanum, daughter of the historian Jevdet Pasha, all of whom are novelists, dealing with current life in a realistic style entirely new in Turkish literature. Hamid Bey has made for himself a name as a playwright. The modern period cannot be said to have entirely revealed its qualities while strife with reactionist control continues. But it has at least shown that there is a future before the writers of Turkey, if they ever have freedom to speak and to develop. See ANTHOLOGY.

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TURKISH MUSIC. See JANIZARY MUSIC.

TUR′KOMANS. A people whose principal home is in the great plains between the Caspian Sea on the west and the Sea of Aral and the Amu Darya on the east—the western part of Turkestan in the broader sense. Some of them are to be found in Persia, Afghanistan, and other regions. They belong by language, and largely by blood, to the Turkic stock. The Turkomans of Turkestan are under Russian rule. See TURKESTAN.

TURKO-TATARS, tûr′kō-tă′tärz. A term used by certain ethnologists to designate a group of Ural-Altaic peoples composed of the Turkic and related so-called Tatar tribes and nations. Under Turko-Tatars are included: The Siberian peoples of Turkic stock, such as the Yakuts and Siberian Tatars; the Kirghiz-Cossacks of the Irtysh Caspian steppes; the Kara-Kirghizes of the Tian-Shan; the Uigurs, Sarts, Uzbegs, and Turkomans of Central Asia; the Tatars of the Volga; Bashkirs, Tchuvashes, and Meshtcheriaks, in European Russia; the Tatars of the Crimea and the Caucasus, including the Nogai, Karatchai, Kumyks, and Basians; the Azerbaijani; the Yuruks of Anatolia; the Osmanli Turks; the historical nations: the Huns, Petchenegs, Cumans, Avars, and perhaps the ancient Bulgars and Khazars, etc. Many of these peoples, like the Osmanlis, Starts, Turkomans, Uzbegs, Azerbaijani, and the Turks of Turkestan, are largely Aryanized in blood, with often an added Semitic strain. Except the Yakuts, whose religion is Shamanism, and those Tchuvashes who have become Christian, the Turkic peoples profess Islam. The empires founded by Turko-Tataric peoples have had a rather ephemeral existence, and the realm of the Osmanli Turks in Europe owes its perpetuation not a little to the very mixed physical character of that people. Consult: Armin Vámbéry, *Etymologisches Wörterbuch der turko-tatarischen Sprachen* (Leipzig, 1878); id., *Die primitive Kultur des turko-tatarischen Volkes* (ib., 1879); id., *Das Türkenvolk* (ib., 1885); Wilhelm Radloff, *Die Sprachen der Türkischen Stämme* (St. Petersburg, 1866 et seq.); id., *Ethnographische Übersicht der Türkstämme Sibiriens und der Mongolei* (Leipzig, 1883); Ernest Chantre, *Recherches anthropologiques dans l'Asie occidentale* (Lyons, 1895) and the periodical *Revue Orientale* (*Keleti Szemle*).

TURK'S CAP. See LILY.

TURK'S HEAD. A name given to a number of coffee houses in London, among which that on the Strand, frequented by Dr. Johnson and Boswell, was the most noted. Others of the name were situated in Change Alley, in Soho, and in Westminster.

TURKS ISLANDS. A group of small islands in the Bahamas, which, together with the Caicos Islands (q.v.), form a dependency of Jamaica.

TÜRLIN, HEINRICH VON DEM. See HEINRICH VON DEM TÜRLIN.

TURMAIR, tōōr′mīr, JOHANNES. The real name of the German historian best known as Johannes Aventinus (q.v.).

TUR′MERIC (Fr. *terre-mérite*, Neo-Lat. *terra merita*, turmeric, apparently deserved earth, best earth, but probably a corruption of an Oriental name, perhaps of Ar. *kurkum*, from Skt. *kunkuma*, saffron), *Curcuma longa*. A plant of the family Zingiberaceæ, a native of the East Indies, much cultivated both in India and in Cochin-China, for its fleshy roots, more than $500,000 worth of which are annually exported from India alone. Young roots abound in a kind of arrowroot, but older ones contain a large quantity of a resinous yellow substance called turmeric, which is used mainly for dyeing. The color is not very stable. Some of its other uses are in chemistry as a test for alkalies, their carbonates and phosphates, some of the alkaloids, and boracic acid, which change it to reddish brown, and as a condiment with many kinds of food, especially as a principal ingredient in curry powder. The plant thrives best in a rich, friable soil, and a situation not liable to be flooded. It is propagated by cuttings of the rootstock, which are planted at distances of 18 inches to 2 feet, in April or May. The crop is gathered in December. This kind of turmeric is sometimes distinguished by the name long turmeric; and the name of round turmeric is given to *Kæmpferia pandurata*, a plant of the same family, also a native of the East Indies, the roots of which are shorter and rounder, but otherwise of very similar quality. They are especially valued for the preparation of an artificial gold varnish, as they yield a better color than the former kind. The Arabic name of turmeric is *kurkum*, whence *curcuma*. Turmeric is not cultivated commercially in the United States. See CURCUMA.

TURMERIC (*Curcuma longa*).

TURN, tōōrn. A town adjoining Teplitz in Bohemia, Austria. It has a magnificent park, bathing establishments, and thriving manufactures of many kinds, particularly porcelain. Pop., 1900, 12,408; 1910, 13,653.

TURNBULL, ROBERT JAMES (1775–1833). An American publicist, born in New Smyrna, Fla. He was educated in England, was admitted to the bar in Charleston in 1794, and practiced there until 1810, when he retired to his plantation. He was active in the Nullification movement, and under the signature of "Brutus" published 31 papers in the Charleston *Mercury*, during 1827, which were afterward collected as the *Crisis*. He was a delegate to the Nullification Convention in 1832, and prepared the address to the people. When the proclamation of President Jackson was read, he was the first to volunteer to resist the general government.

TURNBULL, WILLIAM (1800–1857). An American civil engineer. He was born in Philadelphia; graduated at West Point in 1819, and was commissioned in the artillery. He was engaged largely in topographical work, and was promoted to a captaincy in the topographical engineers in 1831, being brevetted colonel in 1847. In the Mexican War he was with General Scott as chief topographical engineer, and took part at Contreras, Churubusco, and the capture of the city of Mexico. He was superintending topographical engineer on the Potomac Aqueduct for the water supply of Washington, D. C., and in charge of government harbor and other engineering works. The building of the New Orleans

Custom House and the Cape Fear River improvements were under his supervision.

TURNBULL, William Barclay David Donald (1811–63). A Scottish antiquary, born at Edinburgh. Educated for the law, he was admitted as advocate at the Scottish bar (1832), but devoted much time to the study of the antiquities and older literature of Great Britain. In 1834 he founded the Abbotsford Club, which did great service by printing works preserved only in manuscripts or old editions. In 1859 he was employed by the Record Commission, and in the next two years published two valuable volumes of calendars of state papers, but on account of his Catholicism he was attacked by the ultra-Protestant party and compelled to resign. He was an industrious and careful editor, and did excellent service by his editions of Middle English and early modern English poetry. His work as genealogist and historical editor was of value. Among his publications may be named: *The Romances of Sir Guy of Warwick and Rembrun his Son* (1840); *The Visions of Tundale* (1843); *Letters of Mary Queen of Scots* (1845); *The Poetical Works of William Drummond of Hawthornden* (1856).

TURNBULL'S BLUE. See Hydroferricyanic Acid.

TURNE′BUS, Adrianus (Fr. Adrien Turnèbe) (1512–1565). An eminent French scholar, born at Andelys, famous as one of the leaders of the Renaissance in France. After completing his studies in Paris he became professor in the University of Toulouse. In 1547 he was called to Paris, where he taught Greek and Latin, and later philosophy, until his death. From 1552 he had charge of all Greek books published by the royal press. Under him appeared the first editions of Philo and Synesius; he himself edited Æschylus, Aristotle's *Ethics*, Cicero's *De Legibus*, Horace and Varro's *De Lingua Latina*, and made many translations. Turnebus' influence extended far beyond the limits of France through his writings and pupils, of whom the most famous was J. J. Scaliger (q.v.). After his death his commentaries, translations, and other writings were published in three volumes (Paris, 1564–80). Consult the *Life* prefixed to these volumes; also Mattaire, *Historia Typographorum Aliquot Parisiensium* (London, 1817); and J. E. Sandys, *A History of Classical Scholarship*, vol. ii (Cambridge, 1908).

TUR′NER, Charles Tennyson (1808–79). An English poet, brother of Alfred Tennyson (q.v.). He was born at Somersby, in Lincolnshire. Like his more famous brother he attended the Louth Grammar School, and then studied at home under the direction of his father, the vicar of Somersby. With Alfred, he published *Poems by Two Brothers* (1827; reissued 1893). In 1828 he entered Trinity College, Cambridge, graduating B.A. in 1832. In 1835 he was ordained and became curate of Tealby, in Lincolnshire, and two years later vicar of Grasby, in the same county. On inheriting a small estate from a great-uncle, Samuel Turner, he added Turner to his name. His last years were passed at Cheltenham. After his juvenile verse he published *Sonnets and Fugitive Pieces* (1830), which were appreciated by Coleridge; and similar volumes in 1864, 1868, and 1873. In 1880 Hallam Tennyson brought together all of his uncle's sonnets and lyrics under the title *Collected Sonnets, Old and New*, and introduced them by a biographical sketch.

TURNER, Charles Yardley (1850–). An American mural landscape and figure painter. He was born in Baltimore, and studied at the National Academy and the Art Students' League in New York City, and afterward under Laurens, Munkácsy, and Bonnat in Paris. He at first exhibited large canvases of historical genre, such as the "Bridal Procession" (Metropolitan Museum, New York), but soon turned to mural painting and executed decorations in many public and municipal buildings and hotels. Good examples of his work, which is well composed, carefully drawn, and realistic in character, are: "The Burning of the Peggy Stuart," and "The Barter with the Indians," in the Baltimore Court House; the two lunettes "Washington Watching the Assault on Fort Lee" and "Fulton's *Clermont* Making its First Trip up the Hudson," in the Hudson County Court House, Jersey City; the panels "Equity" and "Law" in the Appellate Court, New York; "Opening of the Erie Canal" and "Marriage of the Waters" in the DeWitt Clinton High School, New York. From 1881 to 1884 Turner was professor of drawing and painting at the Art Students' League, New York, and he was elected a member of the National Academy of Design in 1886. From 1912 he was director of the Maryland Institute of Art and Design. He made Washington City his residence, but maintained studios in New York and Baltimore.

TURNER, Cuthbert Hamilton (1860–). An English theologian, born in London. He was educated at Winchester College and at New College, Oxford, and at Oxford was an assistant lecturer from 1888 to 1901, first Speaker's lecturer in biblical studies in 1906–10, and thenceforth lecturer in early Christian history. From 1899 to 1902 he was the first editor of the *Journal of Theological Studies*. His publications include: *Ecclesiæ Occidentalis Monumenta Iuris Antiquissima* (2 vols., 1899–1913); *The History and Use of Creeds and Anathemas in the Early Centuries of the Church* (1906); "Organization of the Church," in *Cambridge Mediæval History* (1911); *Studies in Early Church History* (1912).

TURNER, Cyril. See Tourneur, Cyril.

TURNER, Frederick Jackson (1861–). An American historian, born at Portage, Wis. He graduated in 1884 at the University of Wisconsin, where (after further study at Johns Hopkins) he was professor of American history from 1892 to 1910. He then accepted a chair of history at Harvard. He became one of the editors of the *American Historical Review*, and in 1910–11 was president of the American Historical Association. He published: *The Character and Influence of the Indian Trade in Wisconsin* (1890); *Policy of France towards the Mississippi Valley in the Period of Washington and Adams* (1906); *Rise of the New West* (1906); *Reuben Gold Thwaites* (1914).

TURNER, Herbert Hall (1861–). A British astronomer. He studied at Clifton College, and at Trinity College, Cambridge, where he was later fellow. For a time he was chief assistant in the Royal Observatory, Greenwich. In 1893 he was appointed fellow of New College, Oxford, and Savilian professor of astronomy in the university. Turner was president of the Royal Astronomical Society in 1903–04. Besides serving as joint editor of *Bedrook* (a quarterly scientific review), he published *Modern Astronomy* (1901); *Astronomical Discovery*

(1904); *Halley's Comet* (1908; 2d ed., 1910); *The Great Star Map* (1912).

TURNER, JOHN HERBERT (1834–). A Canadian government officer. He was born at Claydon, England, was educated there, and went to Canada in 1856. After a few years in business at Charlottetown, Prince Edward Island, he removed to Victoria, British Columbia, and founded a mercantile house of which he continued to be the head. Entering politics, he was a Conservative member for Victoria in the Provincial Legislature in 1887–1901. He was Provincial Minister of Finance and Agriculture (1887–98; 1899–1901), Premier (1895–98), and in 1901–15 he was agent-general for British Columbia in London.

TURNER, JOSEPH MALLORD WILLIAM (1775–1851). The most celebrated landscape painter of the English school. He was born in Covent Garden, London, April 23, 1775, the son of William Turner, a barber. Almost in his infancy he began to paint and draw. He had little education beyond reading, which he learned from his father, and writing, which was all he acquired at school. He was constantly employed in coloring prints and similar work, his father offering him every possible facility for artistic education. Before 1789 he was placed with Thomas Walton, an architect, to learn perspective, but proved a sorry pupil. Afterward he studied with Thomas Hardwick, on whose advice he entered the Academy Schools in 1789 to study landscape. He was admitted to the studio of Reynolds, under whom he copied portraits and perhaps learned oil technique; but Sir Joshua had little influence upon him.

Turner's first drawing exhibited at the Academy was a view of Lambeth Palace (1790). For some years he was occupied with designs for prints in magazines, which necessitated long sketching tours over England and Wales. He continued his artistic education, however, as one of the coterie of young artists who frequented the hospitable abode of Dr. Thomas Munro, whom Ruskin calls "Turner's real master." Here he found patronage and encouragement; here, too, he met Girtin and Cozens. He was influenced by Girtin, the founder of modern water-color painting, with whom he sketched much and formed a close acquaintance. The success of Girtin's Yorkshire aquarelles moved Turner, in 1797, to make a similar attempt, and his journey in Yorkshire and the north resulted in his forming several important friendships, such as that with Dr. Whitaker, whose works Turner afterward illustrated with some of his best designs. It also had a marked influence upon his artistic career, as is shown by his exhibit at the Academy in 1798, which proclaimed his genius as a painter of poetic landscape, in such pictures as "Morning on the Comston Fells, Cumberland" (National Gallery), and aquarelles like "Norham Castle" (Metropolitan Museum, New York), which Turner esteemed of high importance in his development. In 1799 he exhibited several Welsh subjects, in rivalry with Girtin, and his first picture of a naval engagement, the "Battle of the Nile"—works which secured his choice as associate of the Royal Academy.

With this year ceases what Ruskin calls Turner's period of development, and the period of his first style (1800–20) begins. Dropping topographical subjects he introduced historical and mythological motifs into his pictures, striving to equal or surpass the masters then most celebrated, William van de Velde, Nicolas and Gaspard Poussin, and Claude Lorraine, in their own subjects. He was especially influenced by Claude, the great painter of light, which Turner also considered the chief problem of painting. In 1802 he paid his first visit to the Continent, the results of which appeared in the exhibition in 1803 of pictures and drawings of the Savoy Alps, most of which are now in the National Gallery, as well as "Calais Pier," and a "Holy Family" of the same year. The same collection possesses his famous "Shipwreck" (1805); his "Garden of the Hesperides" (1806), painted in the classical style in rivalry with Poussin; and the "Sun Rising in the Mist" (1807), one of his best and most individual works. From 1807 to 1819 he was engaged on his *Liber Studiorum* (q.v.), in rivalry with Claude's *Liber Veritatis*. The etchings for these plates, all of which were supervised or executed by Turner himself, show the master at his very best. He now made travels in Devonshire, in the north of England, in Scotland, and on the Continent. Among other important works of this period are: "Apollo and Python" (1811); "Hannibal and his Army Crossing the Alps" (1812); "Crossing the Brook" (1815); and "Dido Building Carthage" (1815), the best of a Carthage series—all in the National Gallery.

With his visit to Italy in 1819 begins his second style (1820–35), the time of his most perfect works, distinguished by lightness and brilliancy of color. Ceasing to imitate the old masters, he nevertheless clung to the classical idea of composition. This mature style is well represented by the first of the series of the wonderful Italian pictures upon which his fame chiefly rests—the "Bay of Baiæ, with Apollo and the Sibyl" (1823); also by "Dido Directing the Equipment of the Fleet" (1828); "Ulysses Deriding Polyphemus" (1829); "Caligula's Palace and Bridge" (1831); and "Childe Harold's Pilgrimage" (1832), all in the National Gallery. During 1833–46 he often visited Venice, which for some time furnished subjects for his art. Of his numerous Venetian subjects the National Gallery possesses a rich collection of water colors, and the "Grand Canal," in the Metropolitan Museum, New York City, is a fine example of the oils. He found time, however, for other subjects, like "Staffa, Fingal's Cave" (1834, New York Public Library); "St. Michael's Mount, Cornwall" (1834), and "The Fighting *Téméraire*" (National Gallery), the best known and most popular of his works. He was still much occupied with designs for illustrations, like *Rivers of England* and *Ports of England*, in 1824. The drawings for the series *England and Wales* (1827–38), in which several line engravers under Turner's supervision brought this art to a new perfection, are wonderful in color and atmospheric effect. In 1830 appeared the lovely illustrations to Rogers's *Italy;* in 1833 the first of his *Rivers of France*, the drawings for which are among the most perfect of his works. He also illustrated the works of Byron, Scott, Milton, Campbell, Rogers's *Poems*, and Moore's *Epicurean*.

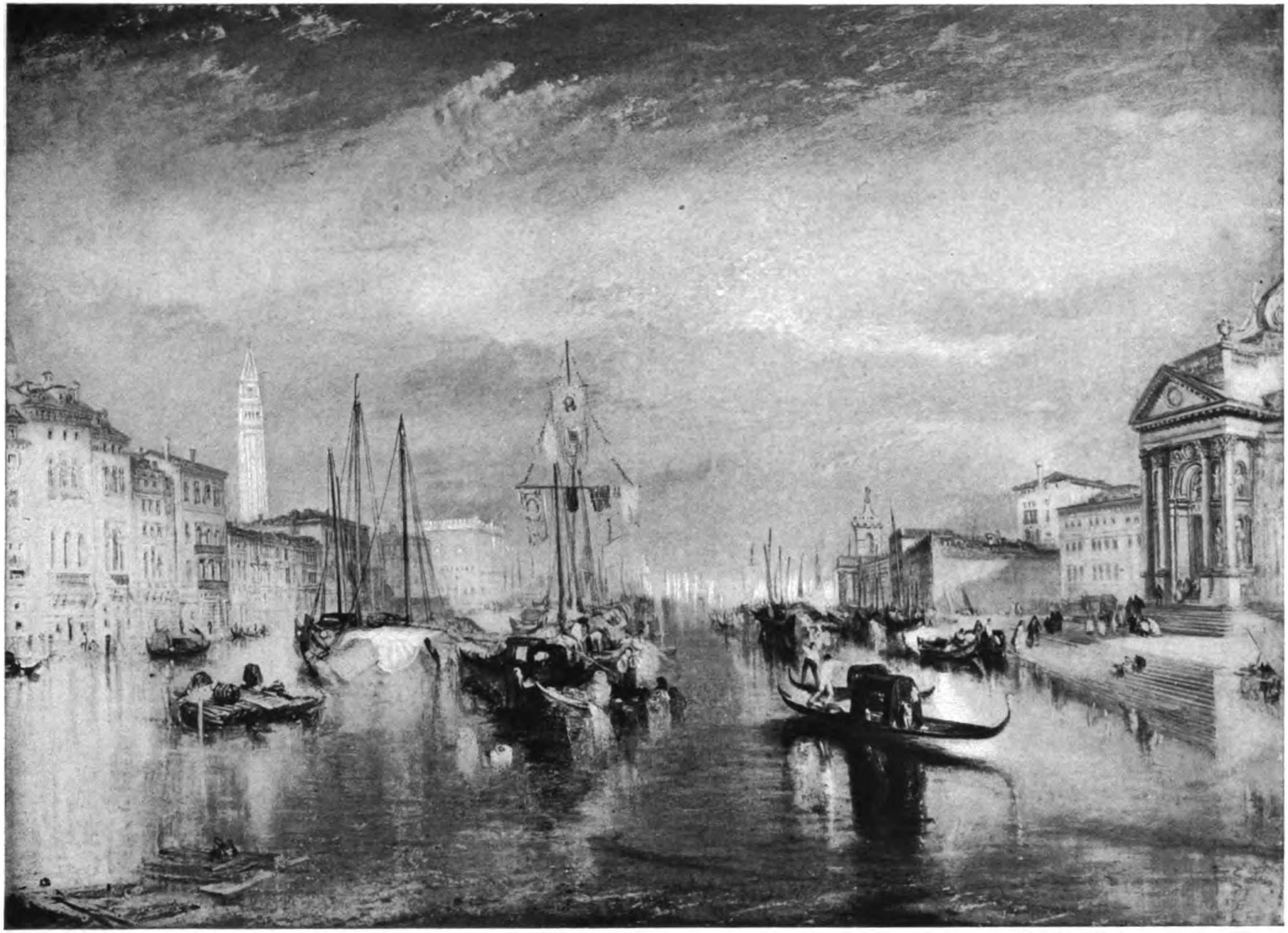
The third period of Turner's art (1835–45) is characterized by the relinquishment of classic composition and a more direct communion with nature, of which he endeavored to render his splendid impressions, foreshadowing the modern Impressionists. Though it tended to become more dreamlike and unreal, his work was more wonderful in color than ever. To this period belong many great works: the "Slave Ship" (1840, Boston Museum); "The Castle of Indolence" (1841, Metropolitan Museum, New York); "Snow Storm" (1842); "Approach to Venice" (1843); "Rain, Steam, and Speed" (1844)—these last in the National Gallery. Here belongs also a series of attempts to represent vague thoughts in color language, like "War—The Exile" (ib., 1842), and many pictures of Alpine scenery, the grandeur of which he has rendered as no other painter, in works like "The Splügen." After 1845 his mind and sight began to fail; but though his work was incoherent, it was still good in color. He began a new series, "The Whalers," which he did not live to complete, and of which there is a good example in the Metropolitan Museum. He died at Chelsea, Dec. 19, 1851, and was buried in St. Paul's Cathedral. His splendid collection of his own works, 262 oils, 135 water colors, 1757 studies in color, and almost innumerable sketches, was bequeathed to the nation, and is for the most part in the National Gallery. He intended that his fortune, £140,000, should be devoted to the establishment of pensions for indigent English artists, but his will was broken and most of it fell into the hands of the lawyers and relatives. Though very economical, even sordid in his personal habits, he was generous to others. Much evil has been said about his private life and character; but those who knew him best found him gentle and considerate, a kind and dutiful son, and a faithful friend. His brusque manner was but a foil of his retiring disposition, which made him inaccessible to society. It is difficult to reconcile these characteristics and the refinement of Turner's art with the seemingly coarse character of his relation to women.

Turner's life was one continuous course of prosperity, and he fully achieved the fame he so ardently desired; in 1802 he was elected Academician, and in 1808 became professor of perspective at the Academy. He easily eclipsed in the public favor all landscapists of his day. In later life his works were attacked, but to atone for this he found in John Ruskin the most eloquent advocate ever possessed by any artist, though these eulogies have created several wrong ideas about Turner's art. Its chief characteristic does not consist, as Ruskin maintains, in a scrupulous fidelity to Nature. He was indeed one of the profoundest students of Nature; but he idealized her, much as did Byron and Shelley in literature. His master passions in art were the rendition of light, and that subtle quality which Ruskin calls the Turnerian mystery, by which objects are rendered with a certain hazy indistinctness of the highest poetical effect. His chief technical quality is not naturalism, but a splendid and brilliant, though sometimes unreal, color. He was as subtle and refined in drawing as in composition. In range of subject, imagination, and sublimity Turner has never been equaled. Though unsound in oil technique, as is evinced by the ruined state of many of his best works, he was a consummate master of water color (q.v.). He was himself an excellent etcher and engraver, trusting to mezzotint to produce the light and shadows; and his designs for illustrations produced a new school of line engraving in England. His facility of execution and diligence were well-nigh incredible. A number of collections in the United States, including the Metropolitan Museum with the Vanderbilt and Morgan loans, and the Public Library, New York, possess good examples of his work.

Bibliography. The most brilliant and sympathetic appreciation of Turner is by John Ruskin in *Modern Painters* (London, 1843–60), and many later editions. The passages relating to Turner were published separately by Frederick Wedmore under the title of *Turner and Ruskin* (2 vols., London, 1900). Consult also: G. W. Thornbury, *Life of Turner Founded on Letters . . .* (New York, 1877); P. G. Hamerton, *Life of J. M. W. Turner* (Boston, 1879); W. C. Monkhouse, *The Turner Gallery: A Series of One Hundred and Twenty Engravings with Descriptive Text* (2 vols., New York, 1879); Sir Walter Armstrong, *Life of Turner* (ib., 1901); *Masters in Art*, vol. iii (Boston, 1902), containing a full bibliography; W. L. Wyllie, *J. M. W. Turner* (New York, 1905); W. G. Rawlinson, *Turner's Liber Studiorum: Description and Catalogue* (2d ed., ib., 1907); A. J. Finberg, *Turner's Sketches and Drawings* (ib., 1910); J. E. Phythian, *Turner* (ib., 1911).

TURNER, Nat (c.1800–31). An American negro slave and insurrectionist, who was born and lived in Southampton Co., Va. From his childhood he fancied himself set apart for some great purpose, and claimed to hear voices and see visions. In 1828 he declared he had a command to rise and slay his enemies, when a sign should be given. A peculiar solar appearance on Aug. 13, 1831, signaled the uprising. With four or five companions, he began near Cross Keys, on Sunday night, August 21, by killing five members of his master's family in their beds. The conspirators were recruited till the number reached 53, and killed all, even infants, in every house in the neighborhood. On the next morning the pupils of a school were slain. By noon the news had spread and the band was routed by a party of white men. United States troops from Fortress Monroe and the militia from various counties of Virginia and North Carolina gathered and the conspirators were hunted down. Turner kept himself concealed for six weeks. On being discovered he fled, but was captured near Cross Keys, October 30, tried and convicted at Jerusalem, and on November 11 was there hanged. Seventeen negroes were executed. It was proved that some in the party were there under strong compulsion. Fifty-five whites were slaughtered and more would have been killed but for the faithfulness of slaves, who in several instances defended their masters. More stringent slave codes were passed in many States, free negroes lost their privileges, suspected negroes were killed or mutilated, and the Manumission movement, which had considerable strength, was checked. Consult Weeks, "The Slave Insurrection in Virginia," in *Magazine of American History* (New York, June, 1891), and W. S. Drewry, *The Southampton Insurrection* (Washington, 1900).

TURNER, Samuel Hulbeart (1790–1861). An American Episcopal theologian. He was born in Philadelphia, and graduated at the University of Pennsylvania in 1807. He was rector of churches in Chestertown, Md., New York, and Brooklyn, and became in 1818 professor of historic theology in the General Theological Seminary, New York, and in 1821 professor of biblical learning and Scripture interpretation. He was also professor of Hebrew in Columbia Col-



J. M. W. TURNER

"THE GRAND CANAL, VENICE," FROM THE PAINTING IN THE METROPOLITAN MUSEUM OF ART, NEW YORK

lege after 1830. Among his works are commentaries on Romans (1824 to 1853), Hebrews (1852), Ephesians (1856), and Galatians (1856); *Bibliographical Notices to the Most Distinguished Jewish Rabbis* (1847); *Companion to the Book of Genesis* (1841); *Parallel References of the New Testament* (1848); *Thoughts on Scriptural Prophecy* (1852). Consult his autobiography (New York, 1863).

TURNER, Sharon (1768–1847). An English historian. He was born at Pentonville, and at the age of 15 was articled to an attorney, to whose practice he succeeded six years afterward. He was a successful practitioner until 1829, when he retired. From an early time his entire leisure had been devoted to a study of the Anglo-Saxon period of English history from the hitherto almost unused Anglo-Saxon manuscripts in the British Museum. These studies culminated in his famous *History of the Anglo-Saxons* (London, 1797–1805; 7th ed., 1852). He continued his narrative in subsequent years under various titles to the end of Elizabeth's reign, but with less happy results. These historical works were finally published in a collective edition under the title *History of England from the Earliest Period to the Death of Elizabeth* (London, 1839). He also wrote *Sacred History of the World as Displayed in Creation and Subsequent Events to the Deluge* (ib., 1832; 8th ed., 1848), and other works.

TURNER, Sir William (1832–1916). A British anatomist and naturalist, born in Lancaster and educated at St. Bartholomew's Hospital. At Edinburgh University he became a demonstrator (1854), was professor of anatomy (1867–1903), and thereafter till his death was principal and vice chancellor. From 1898 to 1904 he was president of the General Medical Council, and in 1900 was president of the British Association. He was knighted in 1886 and received the K.C.B. in 1901. From 1866 to 1894 he was one of the editors of the *Journal of Anatomy and Physiology.* Turner published numerous memoirs on human and comparative anatomy and prepared several of the reports of the *Challenger* deep-sea scientific expedition.

TURNER, William Wadden (1810–59). An American philologist, born in London. In 1818 he emigrated to New York, and became a printer's apprentice. He was librarian of the University of New York, instructor in Hebrew in Union Theological Seminary, and from 1852 librarian of the United States Patent Office. Besides contributions to learned societies and periodicals, he published with Isaac Nordheimer *A Critical Grammar of the Hebrew Language* (1851), and *Grammar and Dictionary of the Yoruba Language* (1858); and translated, with P. J. Kaufmann, Mackeldey's *Compendium of Modern Civil Law,* and the greater part of Freund's *Latin-German Lexicon.*

TURNHOUT, tųr-nout′. A town in the Province of Antwerp, Belgium, 25 miles east by north of the city of Antwerp (Map: Belgium, C 3). It has an old castle, utilized as a court of justice and a prison, and the church of Ouel-Turnhout with noteworthy paintings. Turnhout manufactures lace, cloth, leather, and playing cards. Leech breeding is also an important industry. The town was the scene of a victory of the Dutch, under Maurice of Nassau, over the Spaniards in 1597, and in 1789 the Austrians were defeated here by the Belgians under Van der Mersch. Pop., 1900, 20,945; 1910, 23,067.

TURNING. See Metal-Working Machinery; Wood-Working Machinery.

TURNIP (from *turn* + *nep,* from AS. *næp,* turnip, from Lat. *napus,* sort of turnip), *Brassica campestris* (*rapa* of some botanists). A biennial plant of the family Cruciferæ, cultivated in cool climates for its globose, oblong or roundish, fleshy roots, which are used as a vegetable and for stock feeding. It is a native of temperate Europe and Asia, growing in fields and waste places. Garden turnips are sown in early spring or even as late as midsummer; field turnips generally in midsummer, so as to avoid the possibility of developing a flower stem in the year they are planted, a development which impairs the quality and impedes the development of the edible part. The varieties both of garden and field turnips are very numerous. The garden turnips are generally of comparatively small size, rapid in growth, and of delicate flavor. The field varieties are larger, single roots weighing 20 to 25 pounds being found at times, and the flesh is of coarser texture. The name Swedish turnip or rutabaga is given to a group cultivated in the same manner and used for the same purpose as the common field and garden variety. The cultivated turnip grows best in rich soil. It is not well suited to clay, though it is often grown thereon. Complete pulverization of the soil is requisite before seed sowing. On light soils, a crop of turnips generally succeeds wheat or oats. Seed may be sown either in drills 2–2½ feet apart or broadcast. The young plants are thinned out to stand 8 inches or more apart, and the ground is stirred and carefully kept clean by cultivation and hoeing. The turnip crop is thus of great use in clearing the land of weeds. In many places part of the crop is eaten on the ground by sheep, which are corralled upon small areas in fields perhaps partly harvested.

COMMON TURNIP (*Brassica campestris or rapa*).

The ordinary turnip and the rutabaga are used for feeding stock, the former less than the latter. Both are coarse fodder, since they are bulky in proportion to their nutritive value. Turnips have the following average percentage composition: water, 90.5; protein, 1.1; fat, 0.2; nitrogen-free extract, 6.3; crude fibre, 1.1; and ash, 0.8. Swedish turnip: water, 88.6; protein, 1.2; fat, 0.2; nitrogen-free extract, 7.7; crude fibre, 1.3; and ash, 1.1. Experiments show that 90 per cent of the total dry matter, nitrogen-free extract. and crude fibre of turnips is digested. In Great Britain, northern Europe, and Canada large quantities of turnips are fed, with other roots, replacing grain to a considerable extent. Roots are little fed in the United States, probably because they are less easily cultivated than corn. Turnips are used especially for sheep. Dairy cattle should be milked before being fed turnips, even in limited quantities, to avoid the possibility of tainting the milk. Sheep prefer the Swedish turnip to all other roots. Slicing and pulping are commonly practiced. Consult *New York Cornell Experiment Station, Bulletin 317*. See Plate of CABBAGE AND ALLIES.

TURNIP INSECTS. There are practically no insects specifically attached to the turnip, although this crop frequently suffers from the attacks of several kinds of insects. The foliage is eaten by very many of the insects which are found upon cabbage (see CABBAGE INSECTS), and the cabbage root maggot sometimes affects the turnip tuber. Several of the root-feeding beet insects also attack turnips. See SUGAR-BEET INSECTS.

TURNOUR, CYRIL. See TOURNEUR, CYRIL.

TURNPIKE. See HIGHWAY; ROAD.

TURN-SEVERIN, or **TURNU-SEVERÍN,** tụrn′sā̆′vā̇-rēn′. A town of Rumania on the Danube just below the Iron Gate, about 175 miles west of Bucharest (Map: Balkan Peninsula, D 2). Near it are the remains of Trajan's Bridge, erected 103 A.D. Pop., 1900, 18,626.

TURNSPIT. A dog. See HOUND.

TURNSTONE. A shore bird (*Arenaria interpres*), related to the plovers and surf bird (q.v.), and found in almost every part of the globe. It breeds in the Arctic regions, but occurs on the coasts of the eastern United States during migrations. It frequents the seashore, and its name comes from its turning over small stones with its bill in search of food. The eggs, four in number, are laid on lonely rocky coasts where there is sparse vegetation. They vary much in color and markings, and are cunningly concealed. The length of the turnstone is rather more than 9 inches. The plumage varies with the bird's age and the season, but is always pied black and white, with rufous or brownish ash. (See Colored Plate of SHORE BIRDS.) On the coasts of the north Pacific is found a turnstone (*Arenaria melanocephala*) which lacks the rufous or brownish ash. These two are the only known species. The turnstone is also known as calico back, calico bird, and horsefoot snipe.

TUR′NUS. In Roman story, King of the Rutuli (q.v.), with capital at Ardea (q.v.). Before the arrival of Æneas (q.v.), King Latinus (q.v.) had promised his daughter Lavinia in marriage to Turnus. Swayed by certain omens, which the seers interpreted as meaning that his daughter should be wedded rather to a foreigner, Latinus disregarded his promise to Turnus and offered Lavinia to Æneas. Turnus organized a powerful coalition of Italians and Etruscans against Æneas and the Trojans. The resultant war, described by Vergil in *Æneid*, vii–xii, ended with a single combat between Æneas and Turnus, in which Turnus was slain. In the *Æneid*, Turnus is the foil to Æneas; he and his allies represent the semibarbarous peoples of Italy which are constrained to give way before the higher civilization of Rome.

TURNU-SEVERÍN. See TURN-SEVERIN.

TUR′PENTINE (OF. *turbentine*, *terebentine*, ML. *terebintina*, turpentine, from Lat. *terebinthinus*, relating to the terebinth, from *terebinthus*, from Gk. *τερήβινθος*, terebinth). The resinous exudations of various species of coniferous trees. When the viscid exudation is distilled without steam, oil or spirit of turpentine passes over, leaving behind a residue of common resin or colophony. The distillation is carried out in copper stills. The mass is gradually heated to 316° F. (158° C.), which is approximately the boiling temperature of oil of turpentine. Crude turpentine is washed with caustic soda and redistilled, producing a water-white product known as turps. The resin remaining in the still is drawn off while hot. French turpentine is distilled by means of a current of steam, and abietic acid is a constituent of the product. The oil or spirit of turpentine dissolves sulphur, phosphorus, wax, rubber, camphor, resins, and other organic substances and mixes freely with alcohol, ether, and glacial acetic acid, but not with water. It is a thin colorless liquid readily recognized by its characteristic odor. Chemically it is a mixture of several isomeric hydrocarbons (terpenes) represented by the formula $C_{10}H_{16}$ and converted by oxidation into a camphor having the composition $C_{10}H_{16}O$. Oil of turpentine is largely used in medicine as an irritant and counterirritant in chronic inflammations. It is an excellent remedy for ringworm, and is given internally also to stop hemorrhages, and as a remedy for gonorrhœa. The administration of turpentine is attended with some danger, as it is likely to produce inflammation of the kidneys. In the arts oil of turpentine is used for the preparation of varnishes and as a thinner and flattener of oil paints. American turpentine is derived from the *Pinus australis* and the *Pinus tæda;* French turpentine from the *Pinus maritima;* Russian and Swedish turpentine from the *Pinus sylvestris* and the *Pinus lederbourii*. Canada turpentine, or Canada balsam, is obtained from the *Abies balsamea*, growing in Canada and the northern United States. The disinfectant "sanitas" is prepared by passing air into a mixture of warm water and Russian turpentine. *Artificial turpentine* is obtained by distilling the wood of pine stumps, and other refuse forms, with steam. The odor is different from that of the natural turpentine and seems to have created a prejudice interfering with its general use. *Turpentine substitute* consists of various mixtures of benzine or similar hydrocarbons with rosin spirit, and is a distinctly inferior article. See NAVAL STORES.

TURPENTINE TREE. See PISTACIA.

TUR′PIN, or **TULPI′NUS** (?–c.800). A supposed mediæval chronicler, Archbishop of Rheims. He is described as a friend and companion of Charles the Great and an eyewitness of the exploits he relates in a chronicle in Latin prose narrating the expedition of the Frankish Emperor against the Saracens of Spain, and particularly the events that preceded and followed the battle of Roncesvalles (q.v.). Turpin's name became attached to this chronicle, but though there was an Archbishop Tilpin of Rheims (c.754–c.800), he has no claim to the description given above, and internal evidence leads to the conclusion that the chronicle is mainly a work of the twelfth century. It seems to have sprung out of the epic ballads and traditions of the Carolingian heroes, and was taken from a manuscript composed probably at Compostella. The poems were changed considerably in order to further pilgrimages to Compostella. The book soon acquired a great popularity, was translated into French by 1206, and was made use of by divers chroniclers, as the author or authors of the *Chroniques de Saint-Denis*, Vincent of Beauvais, and others. There have been several editions of the chronicle in Latin; the best, by Ferdinand Castets, was published at Paris and Montpellier in 1880. It has been translated into many languages, among others into English by Rodd (London, 1812), and reprinted in *Mediæval Tales*, in Morley's Universal Library (London, 1890). For editions and secondary works, consult August Potthast, *Bibliotheca Historica Medii Ævi*, vol. ii (Berlin, 1896), and especially Gaston Paris, *Histoire poétique de Charlemagne* (new ed. by Paul Meyer, Paris, 1905).

TURPIN, RICHARD, commonly called "Dick Turpin" (1706–39). An English highwayman. He was born at Hempstead, Essex, where his father was an innkeeper. He was apprenticed to a butcher, and, detected in cattle stealing, he fled and joined a gang of thieves. They committed several brutal robberies, but disbanded after two of their number had been captured and hanged. Turpin became associated with the highwayman Tom King, whom he fatally shot when trying to prevent King's arrest. Turpin escaped into Yorkshire, where he passed for a gentleman, but was soon suspected, captured with some stolen horses, tried, and executed. Turpin's reputation as a hero, and a man of courage and generosity, together with his marvelous ride from London to York, are fabrications, enhanced by Ainsworth's vivid characterization in the novel *Rookwood* (1834).

TURQUOISE, tûr-kois′ *or* tûr′kois (OF. *turquoise, turques*, Fr. *turquoise*, fem. of *turquois*, Turk., from *Turc*, Turk). A hydrated aluminium and copper phosphate that is usually found massive. It is opaque, has a waxy lustre, and occurs in various shades of blue to green. The peculiar bluish-green or robin's-egg tint is the preferred color for gems. Turquoise is found in narrow seams and irregular patches in igneous and volcanic rocks. The best specimens come from the vicinity of Nishapur, Persia, but the mineral is found also at various localities in Asia Minor, Turkestan, and Siberia. In the United States, the locality in the Los Cerillos Mountains, near Santa Fe, N. Mex., was worked by the ancient Mexicans, and still yields fine stones. Other localities in the United States are in Colorado, Arizona, Nevada, and California. Among the early Mexicans it was regarded as emblematic of success and was worn to preserve health. The peculiar property of the turquoise, of becoming grayish green in color as it gives up its moisture, led to a belief that its dullness foretold misfortune, and hence the Oriental proverb that the turquoise pales when the well-being of the giver is in danger. It was believed in the Orient to be a remedy for diseases of the head and heart. Bone turquoise or odontolite is fossil bone colored blue by iron phosphate. Consult Berthold Laufer, "Notes on Turquoise in the East," in Field Museum of Natural History, *Publications: Anthropological Series*, vol. xiii (Chicago, 1913), and J. E. Pogue, *The Turquois* (Washington, 1915).

TURRECREMATA, tōōr′rȧ-krȧ-mä′tȧ. See TORQUEMADA.

TUR′RET (OF. *tourette, touret*, little tower, dim. of *tur, tour*, Fr. *tour*, tower, from Lat. *turris*, Gk. *τύρσις, tyrsis, τύρρις, tyrris*, tower). A revolving tower of circular or oval section in which naval guns are mounted. Fixed towers are commonly called barbette towers or barbettes, as all gun towers of this class on modern ships are designed to have the guns fire over the tops of their walls. In all recent ships these towers are surmounted by revolving turrets which contain the guns.

TURRETIN, tụr′tăn′, or **TURRETINI**, tōō′rȧ-tē′nē, FRANÇOIS (1623–87). A Swiss Calvinistic theologian. He was born in Geneva; studied theology first in his native city and afterward in Holland and France; was pastor at Geneva, 1647; removed to Leyden, 1650; and was recalled to Geneva as professor of theology, 1653. His principal work, *Institutio Theologiæ Elencticæ* (1679–85; new ed., Leyden, 1696; reprinted Edinburgh, 1847–48), ranks high among the strictest expositions of Calvinistic theology. He was one of the authors of the Helvetic Consensus (1675) directed against the milder theology of Saumur. (See AMYRAUT.) His complete works were published at Geneva in 1688. His son, JEAN ALPHONSE (1671–1737), was born at Geneva, and was professor there of ecclesiastical history, 1697. He followed the Saumur theology, and endeavored to unite the Reformed and Lutheran churches. His chief work is *Cogitationes et Dissertationes Theologicæ* (1711–37). His collected works were published at Leuwarden (1774–76). Consult the lives of the elder and the younger Turretin, as they are commonly called, by E. de Bude (Lausanne, 1871; 1880).

TURTCHANINOV, tụr-chä′nĭ-nôf, PIOTR IVANOVITCH (1779–1856). A Russian composer of Church music. He was born in the Government of Kiev and studied under Sarti and Videl. In 1798 he became chorister at Kiev, and later held similar positions elsewhere. In 1827 he became instructor at the Imperial chapel, and in 1831–41 was a priest of the Imperial church of St. Petersburg. Turtchaninov's special contribution to Church music was his harmonization of ancient melodies contained in the liturgy. His masterly arrangements, published posthumously in four volumes, are characterized by very independent leading of the voices, the assignment of the *cantus firmus* (q.v.) generally to some other voice than the soprano, and the faithful preservation of the original intervals through avoidance of chromatic alterations.

TURTLE (probably a corruption of *tortoise*, or of Sp. *tortuga*, Portug., It.. *tartaruga*, Fr. *tortue*, tortoise; in either case ultimately from Lat. *tortus*, twisted, so called on account of the crooked feet; probably influenced by popular etymology with Eng. *turtle*, sort of dove). A shell-incased reptile of the order Chelonia. The word "turtle" is used mainly to indicate the large marine forms, although in the United States it is applied freely to both fresh-water and land forms. "Tortoise" (q.v.), strictly speaking, refers to land forms.

Structure. The body of a turtle is invariably short and broad, and is protected above and below by somewhat bony shields, with spaces between them in front and behind, into which the head and legs may be drawn. The conical tail is usually bent around against the side of the body when the turtle retracts into the shell, thus covering the circular vent. The armature or "shell" is composed of an upper part, the "carapace," and a lower, the "plastron." The carapace is formed from the ribs, of which there are eight pairs; and from the annular parts of the dorsal vertebræ, expanded into plates, which are joined to each other by dentilated sutures, so that the whole acquires great firmness, and the dorsal vertebræ are rendered immovable. The plastron is formed of pieces which represent the sternum or breastbone, and which are ordinarily nine in number, and have names, as also have the parts of the carapace. The box tortoise has certain plates movable, so as more completely to inclose its body. The turtles and other aquatic chelonians cannot thus withdraw their head, tail, and limbs from danger, but their greater activity of movement compensates for this. The above remarks apply to all turtles (Thecophora) except the leatherbacks (Athecæ), whose body is jacketed in a continuous leather-like case composed largely of a mosaic of polygonal bony plates; and the vertebræ and ribs are not fused with, but are free from, the carapace. See LEATHERBACK.

Externally the entire shell is covered with horny epidermal plates or shields of various forms and ornamentations, but arranged in all families on a regular plan. Each shield grows individually, the rings visible upon many of them indicating each a year's growth—at least in countries where a winter hibernation and consequent suspension of growth take place. These plates may be detached by heat, and in the hawksbill are of the beautiful material called "tortoise shell" (q.v.). The neck, legs, and tail are often provided with a horny scaled armature. A cuticular layer covers the outside of the armature and is shed in fragments from time to time. The skull agrees fundamentally with that of crocodiles, but has several peculiar features, and is very solid. The mouth is bounded by a more or less horny beak like that of birds. The jaw is toothless, and the food is swallowed whole. There is, therefore, no need of a delicate sense of taste, and this sense is degenerate. In the stomach there are no organs of trituration, and the process of digestion is necessarily very slow, and is dependent on the action of the gastric juice. The heart is short, thick, and has but one ventricle. The lungs are large and are capable of containing much air. The air is drawn into the mouth, the passages to the nares are then stopped by the tongue, and the air is gulped down. This way of supplying the lungs is required by the rigidity of the armature, which prevents chest expansion and contraction. Turtles can remain under water for an hour or so without renewing the lung contents. Their eyesight is very keen. The eye is protected by an upper and a lower lid and also by a nictitating membrane, as in birds. The sense of hearing is very acute.

Habits and Habitat. When startled, some turtles, such as the wood turtle, give a loud snakelike hiss. The males of the large Galapagos tortoises, according to Darwin, bellow or roar at the breeding season. The common painted turtles utter a piping note, particularly in the spring. Turtles are diurnal except at the breeding season. With the exception of sea turtles, the habitat of any individual turtle is very local. Tortoises and terrapins that have been marked have been observed in the same pasture year after year. Sea turtles return to a locality to breed. Those in the temperate region hibernate through cold weather buried in earth or mud. Marine forms have the legs modified into huge paddles, while amphibious forms have leglike limbs only partially webbed. The coloration of those that spend considerable time on land simulates that of the ground. One form (see MATAMATA) has a fringed or foliaceous neck of much service in hiding it while seeking prey or avoiding foes. About 250 species of Chelonia are known, the most numerous species being found in fresh water, generally in warm climates. The marine species are the largest. Several kinds occur in the Alleghany region at considerable altitudes, but none live in the Rocky Mountains. Chelonia are not numerous in species on the California coast, or in Europe, while on the Asiatic coast they are abundant.

Some of the sea turtles, the land tortoises (q.v.), and a part of the fresh-water terrapins (q.v.) are herbivorous, and these are the ones commonly eaten by man. Other sea and fresh-water forms feed entirely or in part on animal food, and are usually ferocious. Fresh-water forms, such as the snapping turtles (q.v.), feed on fish, mussels, earthworms, insect larvæ, young ducks, and the like. The box turtle eats mushrooms and berries, and not infrequently makes raids on tomato gardens. Certain pond forms are practically omniverous.

Aquatic turtles come on land usually on moonlight nights at breeding time to deposit their eggs. A sandy slope is preferred. Here they dig a hole with the hind feet, let the eggs fall within it, and replace the sand deftly. The female then retreats quickly to the water. Almost any soil will suffice for the American painted turtle, and the same rotten log may be utilized by many musk turtles until it holds hundreds of eggs. These, if not dug up by some animal, are left to hatch by the aid of the sun's heat. The snapping turtle deposits from 18 to 30 eggs in the early morning hours. The wood, painted, and skunk turtles, which lay from three to eight eggs, choose the afternoon for egg laying. The eggs of snapping turtles are usually spherical and about the size of a walnut. The shell is tough and leathery. Certain other turtles lay oval eggs, and a few eggs having a shell of a fine porcelain texture. The eggs hatch slowly, some kinds only after three or more months. As soon as the young hatch they begin to creep about and to travel down inclines until they reach water. All the species are extremely tenacious of life; they are capable of extraordinary abstinence, and of living long after having sustained injuries which would have destroyed almost any other animal. They are remarkable for their longevity, examples of which are mentioned under TORTOISE.

Economic Value. The flesh of those which subsist on animal food is musky and unpleasant; that of vegetable feeders is much esteemed. Most of the eggs are excellent. Vast quantities of eggs of the large Amazonian "arrau" (*Podocnemis expansa*) are pressed to obtain oil of commercial value. The most highly esteemed for food is the green turtle (q.v.), and its relative the "edible" turtle of the East Indies. Many smaller kinds are eaten, including the favorite American terrapin, the snapping turtle, and other fresh-water forms.

Classification. The Chelonia were at first divided according to modifications of the feet. Cope, recognizing the separability of Trionychoidea, also, in 1870, emphasized a division based upon the mode of carrying the neck, one group (Pleurodira) bending it sidewise in withdrawing the head, and the other (Cryptodira) withdrawing it in an S-shaped curve in a vertical plane. A more worthy division is Athecæ for the shell-less Sphargidæ, or leatherbacks, and Thecophora for all other kinds. Boulenger's classification is as follows:

- CHELONIA
  - Athecæ.....................Sphargidæ.
  - Thecophora
    - Pleurodira
      - Pelomedusidæ.
      - Chelydidæ.
      - Carettochelydidæ.
    - Cryptodira
      - Chelydridæ.
      - Dermatemydidæ.
      - Cinosternidæ.
      - Platysternidæ.
      - Testudinidæ.
      - Chelonidæ.
    - Trionychoidea...Trionychidæ.

The Pelomedusidæ are a small family of African and South American turtles including the large and valuable "arrau." The family Chelydidæ includes the curious matamata (q.v.), certain long-necked Australian types (Chelodonia), and the South American Hydromedusa. The Carettochelydidæ are a family in which is set a strange small turtle of New Guinea, whose "shell" is covered with soft skin instead of horny shields. Of the cryptodirous families, the Chelydridæ are represented by the various snapping or "alligator" turtles (q.v.), and the Dermatemydidæ by a few species of aquatic tortoises of Central America. The Cinosternidæ are the family of the North American "skunk" turtles. (See MUSK TORTOISE.) Platysternidæ includes only a single Siamese water tortoise. The Testudinidæ, on the other hand, are the most populous of Chelonian families and nearly cosmopolitan. The shell in this family is always covered with well-developed horny shields, the plastron has nine bones, and the neck is completely retractile. About 20 genera with more than 130 species are now recognized; but the generic distinctions are not easily recognized by external appearances. Here are classified the North American "mud turtles" of the genus *Chrysemys*, which abound in all still waters, as do the "pond tortoises" (*Emys*) of Europe, the terrapins (q.v.), and the box tortoises (*Cistudo*). The last get their name from the fact that the plastron, which is united with the carapace by ligaments, is divided into two movable lobes, connected by a hinge permitting them to be lifted up against the overhanging carapace, and closing both ends of the shell perfectly after the animal has drawn within its defenses. The common box tortoise of the United States (*Cistudo carolina*) is entirely terrestrial, numerous everywhere, and interesting in its habits. In this family also fall the various land tortoises of the type-genus *Testudo*. Most of the foregoing are terrestrial or fresh-water forms, while the remainder are marine and have the limbs modified into swimming paddles or "flippers." The family Chelonidæ contains many great extinct forms, from the Cretaceous to recent times, and a few existing species, of which the green turtle, hawksbill, and loggerhead (qq.v.) are representatives. The order Trionychoidea contains only the family Trionychidæ, which have no rigid plates on the flat carapace, but a soft leathery skin, and the plastron imperfect. See SOFT-SHELLED TURTLE.

Fossil Turtles. The origin of the Chelonia is uncertain. Otocœlus, an armored cotylosaur from the Permian of Texas, has been suggested by Cope as a possible progenitor, but the relationship is doubtful. Certain characters of shoulder-girdle and ventral abdominal ribs in the plesiosaurs indicate that this order may have genetic affinity with the turtles, and the dicynodonts and placodonts of Triassic age resemble turtles remarkably in many structures of the skull and limb bones. (See THEROMORPHA.) All these groups belong to the synapsid division of Reptilia. Little evolution is demonstrable within the chelonian order from its first appearance in the European Upper Trias to the present, except in the degeneration of the carapace and elongation of the digits in the marine forms. The oldest turtle known is *Proganochelys*, from the Keuper (Upper Trias) of Germany. A probably primitive character in this genus is the well-developed row of supra-marginal plates. The Lower Jurassic strata have, as yet, yielded no chelonian remains, but in the Upper Jurassic, Cretaceous, and the Tertiary they are abundant, chiefly in the Northern Hemisphere. The existing suborders Cryptodira and Pleurodira appear to be fully differentiated in the Upper Jurassic, the Trionychia in the Upper Cretaceous of North America. As a rule the known Jurassic turtles have a solidly roofed skull like that of the recent green turtle, and a well-developed carapace. Professor Baur's opinion is that the earliest turtles were swamp turtles, and that the soft-shelled Trionychia and the marine families evolved from these along one line, and the land tortoises along another.

Cryptodira is the suborder most widely represented among fossils, as among recent turtles. Several of the existing families, including the marine Chelonidæ and the "leather turtles," are already differentiated in the Cretaceous, and in the Lower Eocene the highly specialized land tortoises appear. Of the Cretaceous sea turtles some attained enormous size; *Protosphargis* from Italy had a shell nine feet long, and in the North American *Archelon* the skull alone measures three feet. The suborder Pleurodira is widely distributed as fossils in various Mesozoic systems. *Miolania*, from the Pleistocene of Queensland, was a huge creature in which the head was armed with bony "horns." The third suborder, Trionychia, is known from the North American Cretaceous and the Tertiary of both hemispheres.

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Baur and Fraas in Germany, Boulenger and Gadow in England, and Hay in America. A recent masterly summary is O. P. Hay, *Fossil Turtles of North America* (Washington, 1908). Consult also Reptile; Tortoise.

TURTLE CREEK. A borough in Allegheny Co., Pa., 12 miles southeast of Pittsburgh, on the Pennsylvania and the Union railroads. A large electrical manufacturing plant of the Westinghouse Electric and Manufacturing Company, employing 16,000 persons, is situated here. There is a Carnegie library and a technical school. Pop., 1900, 3262; 1910, 4995.

TURTLEDOVE. See Dove; Pigeon.

TUR'TON. A cotton-manufacturing town in Lancashire, England, 4½ miles north of Bolton. Pop., 1901, 12,353; 1911, 12,648.

TURVEYDROP, Mr. A character in Dickens's *Bleak House*, said to have been modeled on George IV.

TUS'CALOO'SA. A city and the county seat of Tuscaloosa Co., Ala., 56 miles southwest of Birmingham, on the Black Warrior River, and on the Alabama Great Southern, the Louisville and Nashville, and the Mobile and Ohio railroads (Map: Alabama, B 2). The University of Alabama, opened in 1831, is a mile east of the city. Other educational institutions are the Tuscaloosa Female College (Methodist Episcopal South), opened in 1860; the Alabama Central Female College; Boy's Training School; and Stillman Institute (Presbyterian), a colored theological school, opened in 1870. The State Insane Hospital, the old State Capitol building, the Federal building, and the bridges spanning the Black Warrior also are noteworthy features. The commercial importance of the city has been increased by extensive improvements on the river, adding considerably to the distance open to navigation. Coal is mined extensively in the vicinity, and at Holt, a suburb, there are a large iron furnace, coke ovens, and a by-product plant. The city is the centre of cotton and lumber interests, and its principal industrial establishments are connected with these. In 1911 the commission form of government was adopted. It was the capital of the State from 1826 to 1846. Pop., 1900, 5094; 1910, 8407; 1915 (U. S. est.), 10,152.

TUS'CANY (It. *Toscana*). Formerly a sovereign grand duchy, now a district (compartimento) on the west coast of Italy (Map: Italy, C 3). It comprises the maritime provinces Grosseto, Livorno (Leghorn), Lucca, and Pisa, the inland provinces Arezzo, Florence, and Siena, and the Province of Massa e Carrara, extending from the sea northward between Liguria and the Apennines. The greater part of Tuscany is mountainous, the Apuan Alps reaching 6385 feet and Mount Amiata 5655 feet. The principal rivers are the Arno, Cecina, Ombrone, and Serchio, all flowing into the Mediterranean. Except in the Maremma, a large marshy region on the southern coast, the climate is mild and healthful. The leading mineral deposits include iron, mercury, borax, copper, and salt; there are many mineral and thermal springs. Among the important agricultural products are wheat, maize, the vine, the olive, and tobacco. For population, see section on that topic under Italy.

Tuscany corresponds nearly to ancient Etruria (q.v.). The Etrurians or Tuscans were the earliest inhabitants known to history. They were conquered by the Romans, by whom in later times the land was called *Tuscia*. During the period of barbarian migrations Tuscia was possessed in turn by the Ostrogoths, the emperors of Constantinople, and the Lombards. The last were conquered by Charles the Great and a Frankish margrave or duke was established with Lucca as his residence. Tuscia formed a part of the Kingdom of Italy or of the Lombards. In 1030 Boniface II of the house of Canossa became Duke of Tuscany. He was also Count of Modena, Reggio, Mantua, and Ferrara. His granddaughter, the Countess Matilda (q.v.), known as "the Great Countess," was an ardent friend of Pope Gregory VII, and one of the most powerful supporters of the papal party during the investiture struggle. At her death, in 1115, she bequeathed all of her wide dominions to the papacy; but the German emperors claimed the duchy as an Imperial fief, and for more than a century "the property of Matilda" was the cause of constant strife between the popes and the emperors. During this period the principal cities became independent and prosperous. Pisa had risen to independence and power long before this, and was now a great maritime Republic. At the close of the thirteenth century she succumbed to the power of her rival Genoa. For several centuries the history of Florence is to a great extent the history of Tuscany. At the close of the twelfth century she was at the head of the Tuscan league of cities formed to resist the Hohenstaufen. This brought her into close alliance with the papacy, and usually Florence remained a firm adherent of the Guelph party.

In the fourteenth century Dante, Giotto, Petrarch, and Boccaccio made Tuscany preëminent in the revival of letters and arts. The Tuscan dialect became the literary language of Italy. In 1406 Pisa submitted to Florence, and soon after she became mistress of Leghorn. Internal dissensions in Florence led to the establishment of the predominance of the Medici (q.v.). Cosimo de' Medici got control of affairs in 1434 and made the supreme power in Florence the hereditary possession of his house. In 1532, through the instrumentality of the Emperor Charles V, Alessandro de' Medici was made Duke of Florence. He was assassinated in 1537, and Cosimo the Great became Duke. The latter added to the territories of the duchy, especially by receiving Siena from Charles V. This gift bound him more closely to Spain, and for nearly two hundred years Tuscany was generally under the influence of Spain. In 1569 the Florentine dominions were erected into the Grand Duchy of Tuscany. The house of Medici became extinct in the male line in 1737. By the terms of the Treaty of Vienna, which had been concluded in 1735, the grand duchy was given to Francis of Lorraine, the husband of Maria Theresa of Austria. Grand Duke Ferdinand III was dispossessed by the French in 1799. By the Treaty of Madrid between France and Spain, in 1801, Tuscany was erected into the Kingdom of Etruria and given to the son of the Duke of Parma. In 1807 Napoleon took possession of the country, which was united with France. Elisa Baciocchi, the sister of Napoleon, received the title of Grand Duchess of Tuscany. In 1814 Ferdinand III was reinstated and ruled until 1824. His successor, Leopold II, did much to promote the prosperity of Tuscany. In 1847 Lucca was annexed to the grand duchy. In February, 1848, Leopold granted a liberal constitution to his subjects, but the tide of revolution carried everything before it, and early in 1849 the Grand Duke fled from his country. A counter-revolution was soon set on foot by the Moderate Liberal party and in a few months Leopold was restored to his throne. In 1850 he entered into a convention with Austria by which Austrian troops were to occupy Tuscany, and, thus supported, he reinstituted a régime of absolutism. In 1859, in consequence of his pro-Austrian policy, he was obliged to leave his state, which was occupied by the forces of Victor Emmanuel. On March 15, 1860, the people by a plebiscite voted the union of Tuscany with Italy.

Bibliography. For the early history of Tuscany, consult the histories of Florence, Pisa, and Arezzo, especially F. T. Perrens, *Histoire de Florence* (9 vols., Paris, 1877–90); Robert Davidsohn, *Geschichte von Florenz* (4 vols., Berlin, 1896–1912). For the later history, Alfred von Reumont, *Geschichte Toscanas seit dem Ende des florentinischen Freistaates* (3 vols., Gotha, 1876–77). For the nineteenth century, Charles Seignobos, *Political History of Europe since 1814* (trans. by S. M. Macvane, New York, 1900), gives a convenient summary and furnishes an ample bibliography. General description: Edward Hutton, *Siena and Southern Tuscany* (New York, 1910); M. H. Hewlett, *Earthwork out of Tuscany* (ib., 1911); J. W. and A. M. Cruickshank, *Smaller Tuscan Towns* (ib., 1912).

TUS′CARO′RA. An important Southern tribe of Iroquoian stock (q.v.). When first known about the year 1670 they resided along the Neuse River in eastern North Carolina, where in 1700 they occupied fifteen villages with an estimated population of 1200 warriors or about 6000 souls, and held paramount influence over all the smaller tribes of that section. They were hostile to most of the leading Southern tribes, but maintained a close friendship with the Northern Iroquois (q.v.), whom they knew as traditional kinsmen. In consequence of encroachments upon their lands, they rose against the whites in September, 1711. A war of two years ensued, in which both Carolina provinces joined forces, together with a great body of Indian allies, against them. Finally defeated, the Tuscarora abandoned their country and fled north to the Iroquois, who received them as the sixth tribe of their confederacy, henceforth known as the "Six Nations." See IROQUOIS.

TUS′CULAN DISPUTATIONS (Lat. *Tusculanæ Disputationes*). A philosophical work in five books by Cicero (44 B.C.), dedicated to M. Brutus.

TUS′CULUM. An ancient city of Latium, about 15 miles south of Rome, situated on a ridge of hills known as the *Colles Tusculani*, and forming part of the Alban Range. We catch the first certain glimpse of its historical existence towards the close of the regal period at Rome, when it had attained a high degree of prosperity and power. Octavius Mamilius, ruler of Tusculum and the foremost prince in Latium, married a daughter of Tarquin the Proud (see TARQUINIUS), and played a conspicuous part in the last of the great struggles made by the banished tyrant to regain his Kingdom. Towards the close of the Republic Tusculum became a famous country residence of the wealthy Romans. As late as the twelfth century the ancient city continued entire; but in 1191 it was stormed by the Romans and razed to the ground. Many fine remains of ancient Tusculum have been dug up in recent times, among them being the amphitheatre, theatre, and city walls. See FRASCATI.

TUSCUMBIA, tŭs-kŭm′bĭ-ȧ. A city and the county seat of Colbert Co., Ala., 125 miles northwest of Birmingham, on the Tennessee River, on the Southern, the Northern Alabama, and the Louisville and Nashville railroads, and on three steamship lines (Map: Alabama, B 1). There are extensive railroad shops, steel furnaces, stove foundries, cottonseed-oil mills, a pipe plant, and a button factory. Features of interest are the Helen Keller Library, courthouse, a huge spring in the heart of the city, and two public parks. Pop., 1900, 2348; 1910, 3324.

TUSKEGEE, tŭs-kē′gē. A city and the county seat of Macon Co., Ala., 44 miles by rail east of Montgomery, on the Tuskegee Railroad (Map: Alabama, D 3). The leading industries are cotton raising and the manufacture of cottonseed oil, meal, and lumber. It is the seat of the Tuskegee Normal and Industrial Institute for negroes. The place was settled about 1800. Pop., 1900, 2170; 1910, 2807.

TUSKEGEE NORMAL AND INDUSTRIAL INSTITUTE. An institution for the education of negroes, founded and conducted by negroes at Tuskegee, Ala., established in 1881 by an Act of the Legislature under the name of Tuskegee State Normal School, with an appropriation of $2000. It was opened July 4, 1881. In 1884 the appropriation was increased to $3000, and in 1893 the institution was incorporated under its present name. In 1916 the attendance had grown to 1650. The faculty consists of 185, employed in the administration of the various departments in teaching and in the extension work of the school. The library contains 19,000 volumes. The endowment fund in 1916 was $1,945,326, including a gift of $600,000 from Andrew Carnegie. The total value of the school plant, including 107 buildings, land, and equipment, is $1,567,062. This does not include 19,527 acres of public lands remaining unsold from 25,000 acres granted by Act of Congress in 1899 and valued at $250,000.

The object of the institute is to give its students a thorough common-school education and at the same time fit them by manual and industrial training to perform successfully some form of skilled labor. The institute also aims, through the Phelps Hall Bible Training School, to fit young men and women for the ministry and other forms of social and religious work. The constant aim is to correlate the literary training with the industrial training and practical interests of the pupils. By this means the work of the students in the trades becomes invested with the character of a demonstration. On the other hand, the principles acquired in the academic studies gain in definiteness, precision, and interest by application to actual situations and to real objects.

Students are admitted on passing an examination in reading, writing, and the fundamental operations of arithmetic. Instruction is given in two sessions. The day school is intended for students able to pay all or the greater part of their expenses in cash. They attend school in the daytime three days each week and are required to work three days each week. The night school is designed for students too poor to pay the small charge made in the day school. Tuition is free. The monthly charge for board and living expenses is $10, of which day-school students may work out from $2 to $4 a month, while pupils of the night schools are given the opportunity to work out all their board.

In the department of mechanical industries, instruction and practice are given in architectural and mechanical drawing, steam and electrical engineering, blacksmithing, brickmaking, carpentry, founding, harness making, carriage trimming, machining, painting, printing, sawmilling, shoemaking, tinsmithing, tailoring, and wheelwrighting. The industries for girls include sewing, dressmaking, millinery, cooking, laundering, domestic service, mattress making, basketry, and nursing. So far as possible the product of the student work is used in the institute, and the surplus is sold. The printing office furnishes all the printed matter of the school, and issues two weeklies and a monthly newspaper for the institution besides three others for persons outside. The school buildings, including the Carnegie Library, are almost wholly the product of student labor. The aim of the agricultural department is by theoretical instruction in scientific principles, and their application in the field, orchard, dairy, and truck garden, to make its students intelligent and successful farmers. To some of the agricultural courses women are admitted. Extension work is carried on through the Tuskegee Negro Conference, the Short Course in Agriculture, farm demonstration work, and traveling institutes for the benefit of farmers in the South. The Russell Plantation settlement and the mothers' meetings are also a part of the community work the school is seeking to do. Booker T. Washington (q.v.), who had been the principal of the institution since its foundation, died Nov. 14, 1915. Major Robert R. Moton, commandant at Hampton Institute, succeeded him. Consult B. T. Washington, *Up from Slavery* (New York, 1900); id., *Working with the Hands* (ib., 1904); id., *Tuskegee and its Peoples* (ib., 1905).

TUSK SHELL, or Tooth Shell. A scaphopod mollusk of the genus *Dentalium*, common in the ocean on muddy bottoms at the depth of from 10 to 40 fathoms, as well as in very deep water. The shell is shaped like a gently curved elephant's tusk and is open at each end. The animal has no head, eyes, or heart, though it has a small elongated digging foot. Its genus first appears in the Eocene rocks. These shells were formerly extensively used by the northwest coast Indians as material for making necklaces and adorning clothing, and were circulated as a shell money (q.v.), called hi-qua.

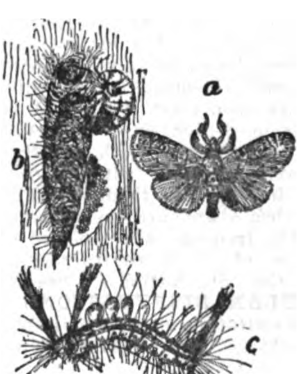
TUSSAUD, tų'sō', Marie, Madame (1760–1850). Founder of the London waxworks exhibit in Baker Street. She was born (Gresholtz) at Bern, Switzerland, and learned at Paris the art of wax modeling, in which she subsequently instructed Madame Elisabeth, sister of King Louis XVI. After a three months' imprisonment during the French Revolution, she brought to London her collection, afterward increased to include about 300 figures. There is connected with it a Chamber of Horrors, with relics of criminals and a collection of instruments of torture. Consult F. Hervé, *Memoirs of Madame Tussaud* (London, 1878), which, however, is not altogether reliable.

TUSSEH, tŭs'se, or **TUS'SER**. See Silkworm.

TUS'SER, Thomas (c.1524–80). An English rhymer. He was born at Rivenhall, near Witham, in Essex, and educated at Eton and at Cambridge. For 10 years he was a musician in the service of Lord Paget of Beaudesert, and thus lived at court. He then settled for a time as farmer in Suffolk, and thereafter moved about from place to place, eventually dying in a debtor's prison at London. He is remembered for *Five Hundreth Poyntes of Good Husbandry United to as Many of Good Huswifery*, a homely proverbial poem, to which is prefixed an autobiography in verse (1573); based upon *Pointes of Husbandrie* (1557) and a *Hundreth Poyntes of Good Husserie* (licensed 1557). Consult the reprints edited by W. Payne and S. J. Herrtage for the English Dialect Society (London, 1878).

TUS'SILA'GO (Lat., coltsfoot). A genus of plants of the family Compositæ. *Tussilago farfara*, sometimes called coltsfoot, is the only species. It has solitary flower heads on scaly scapes, appearing before the leaves in early spring. Both disk and ray flowers are yellow, the leaves heart-shaped, angular, downy beneath, somewhat glutinous and subacrid. The leaves of the butter bur (*Petasites vulgaris*), which has been naturalized from Europe, resemble those of *Tussilago*, but are much larger; the pale flesh-colored flowers also appear before the leaves, but are in a dense thyrsus. The flowers of both are much sought after by bees.

TUSSOCK MOTH. Any moth of the family Liparidæ, a name suggested by the tufts of hairs, often bright-colored, upon the caterpillars. The moths are dull-colored, and the females of some species are wingless. Twenty species occur in the United States. The group includes some famous enemies of fruit, shade, and forest trees. Two imported species, the gypsy moth (q.v.) and the browntail moth (*Euproctis chrysorrhœa*), do great damage in New England. The latter species flies during midsummer, when the female lays from 200 to 300 eggs underneath leaves near the tips of branches and covers them with hair. The larvæ appear in from two to three weeks and skeletonize the leaves. They also feed on apple and pear fruits. In late September they retire into cases formed of leaves, attached to the twigs by silken threads, and remain there until the leaf buds open in



TUSSOCK MOTH.

a, adult male of *Hemerocampa leucostigma*; *b*, cocoon fastened to the wall and wingless female carrying egg sac; *c*, caterpillar.

the spring, feeding upon the young foliage, flowers, and fruit until June, when they pupate. The caterpillars when abundant are annoying to human beings from the mechanical irritation to the skin caused by their barbed hairs.

The white-marked tussock moth (*Hemerocampa leucostigma*) is a well-known enemy of shade and fruit trees in the eastern United States. The female is wingless, the male small and inconspicuous. The overwintering eggs are laid in a glistening white frothy mass, attached to the outside of the female's cocoon, which is usually placed on a tree trunk. The young caterpillars hatch in the spring and feed upon the leaves. There are two or three generations each year. Winter pruning and burning of the hibernacula of the former species, and summer spraying the larvæ of the latter with arsenites, have been recommended. Consult W. J. Holland, *The Moth Book* (new ed., New York, 1905).

TUTELO, tōō′te-lō, or **TOTERO,** tŏt′ēr-ō. An eastern tribe of Siouan stock, calling themselves Yesañ, formerly on the upper Roanoke and Dan rivers in Virginia and North Carolina, and in alliance with the cognate Saponi (q.v.). They were first visited in 1670 by the German traveler John Lederer, who calls them Nahyssan. In 1701 Lawson found them near central North Carolina, preparing to move to the settlements for protection against the Iroquois, who had driven them from villages on the Roanoke. They were much reduced in number and unable any longer to stand against their enemies. The refugee tribes were afterward settled by Governor Spotswood of Virginia near Fort Christanna, in what is now Brunswick Co., Va., where they remained until about 1740, when, finally at peace with the Iroquois, they removed to the north, together with the Saponi, and settled on the Susquehanna at Shamokin, now Sunbury, Pa. Later they were adopted by the Cayuga, thus becoming a component part of the Iroquois League. Their village near Cayuga Lake being destroyed by Sullivan in 1779, they fled to Canada and found their final home with the Iroquois on the Grand River Reservation, in Ontario, locating on Tutelo Heights, near Brantford. They are practically extinct. Consult James Mooney, *Siouan Tribes of the East* (Washington, 1895).

TUT′ICOR′IN. A seaport in the District of Tinnevelli, Madras, India, 443 miles by rail south by west of the city of Madras, on the Gulf of Manar (Map: India, D 8). The manufacturing establishments are chiefly connected with the cotton industry. Pearl fishing, formerly the principal industry, has greatly declined in importance. Pop., 1901, 28,048; 1911, 34,758.

TU′TONITE. See Explosives.

TUTTIETT, Mary Gleed. See Gray, Maxwell.

TUTTLE, tŭt′'l, Daniel Sylvester (1837–). An American Protestant Episcopal bishop, born at Windham, N. Y. He graduated at Columbia in 1857, and at the General Theological Seminary in 1862, and was ordained a deacon in 1862 and a priest in 1863. He was rector of a church at Morris, N. Y., until 1867, and Missionary Bishop of Montana, Utah, and Idaho until 1886, when he was transferred to the diocese of Missouri. In 1903 he became presiding Bishop of his denomination in the United States. He published *Reminiscences of a Missionary Bishop* (1906).

TUTTLE, Herbert (1846–94). An American historian, born at Bennington, Vt. He graduated in 1869 at the University of Vermont. From 1880 to 1881 he was a lecturer on international law at the University of Michigan, and in the latter year was appointed to the chair of politics and international law in Cornell University. He was subsequently transferred to the chair of modern European history. He published: *German Political Leaders* (1876); *History of Prussia to the Accession of Frederick the Great* (1884); and a *History of Prussia under Frederick the Great* (1888).

TUTTLINGEN, tōōt′lĭng-*en*. A town of the Kingdom of Württemberg, Germany, on the right bank of the Danube, 64 miles southeast of Strassburg (Map: Germany, C 5). It has shoe factories, tanneries, and manufactures surgical instruments, cutlery, leather, and woolen goods. Pop., 1900, 13,465; 1910, 15,862. Tuttlingen is historically notable as the scene of a battle in 1643, during the Thirty Years' War, in which an Austro-Bavarian force defeated the French.

TUTUILA, tōō′tōō-ē′lȧ. The principal island of American Samoa, 46 miles southeast of Upolu (Map: Samoan Islands, D 3, 4). Area, 40.2 square miles. Its surface is mountainous and picturesque with luxuriant forests and there are signs of volcanic activity. The climate is subtropical and the rainfall averages about 180 inches annually. The principal articles of import are cotton goods, meats, hardware, breadstuffs, and fish. Copra is practically the only export. It is a government monopoly and a source of revenue which makes the island self supporting. In 1913 the imports were valued at $133,399 and the exports at $132,645. Tutuila contains the best harbor of the Samoan group, Pago Pago (q.v.), which is also the seat of government. The island together with the Manua group and a few other islands belonging to the United States is administered by a naval governor. Pop., 1912, 7251. See Samoan Islands.

TUXTLA GUTIÉRREZ, tōōs′tlȧ gōō′tē-âr′-râs. The capital of the State of Chiapas, Mexico, 270 miles southeast of Vera Cruz (Map: Mexico, M 9). The principal building is the government palace. The main industries are tanning, indigo preparations, and general commerce. Pop., 1900, 9395; 1910, 10,239.

TÚY, tōō′ē. A Spanish frontier town of the Province of Pontevedra, in Galicia, on the Miño, 63 miles north of Oporto, Portugal (Map: Spain, A 1). The cathedral is a fortress-like structure. The international iron bridge spanning the Miño is worthy of note. The town is in the midst of the fertile Vega del Oro, celebrated for the culture of fruits, vegetables, and silks. Tanneries and soap factories, with a brisk trade with Portugal, form the chief industries of the town. Pop., 1900, 11,631; 1910, 11,986.

TUY. A town of Luzon, Philippines, in the western part of the Province of Batangas. It lies about 24 miles northwest of Batangas. Pop., 1903, 2430.

TVASHTAR, tvăsh′tȧr (Skt. *tvaṣṭṛ*, creator, from *tvaks*, *taks*, to fashion; connected with Av. *θwaxš*, to create, or Tvashtṛi). A divinity of Vedic Hindu mythology of uncertain origin, possessing many of the characteristics of Hephæstus or Vulcan (q.v.). As the divine artificer his chief works are the thunderbolt of Indra (q.v.) and a cup for the soma (q.v.) of the gods. Similarly he is the deity who fashions all living forms, both of men and of animals, so that in later texts he is said to have produced the whole world, and to have been the ancestor of all mankind. He is also a creator of gods, particularly of Brihaspati (q.v.), Agni (q.v.), Saranyu, wife of Vivasvant, who bore the Asvins (q.v.) and Yama (q.v.) and Yami, the primeval pair, and, probably, Indra, although this god is sometimes said to have killed his sire in order to obtain the soma. He is further connected with the Ribhus (q.v.), who are also skillful artificers. Consult A. A. Macdonell, *Vedic Mythology* (Strassburg, 1897), and L. D. Barnett, *Antiquities of India* (London, 1913).

TVER, tvĕr. A government of central Russia. Area, 25,225 square miles (Map: Russia, E 3). The surface is largely an elevated plain intersected by deep river valleys. The northwestern part is hilly. The government is watered chiefly by the upper Volga with its tributaries and the Dvina. The soil is not fertile, and the supply of grain is insufficient to meet the domestic demand. The household industry is well developed, entire sections of the government being engaged in the production of footwear, felt goods, linen, nails, axes, agricultural implements, etc. The local manufactures are chiefly cotton goods, flour, leather, spirits, etc. Pop., 1897, 1,769,135; 1912, 2,250,200.

TVER. The capital of the government of the same name, situated on the Volga, 298 miles southeast of St. Petersburg (Map: Russia, E 3). It is the see of a Greek Catholic bishop, has a thirteenth-century monastery and an Imperial palace occupied by the Governor. Tver is one of the chief cotton-manufacturing centres of Russia. There are also flour mills, wagon factories, saw mills, etc. Pop., 1910, 62,652. Tver dates from 1181 and was the capital of an independent principality from the thirteenth century to the end of the fifteenth, when it was annexed to Moscow.

TWACHTMAN, twŏkt′man, JOHN HENRY (1853–1902). An American landscape painter. He was born in Cincinnati, and studied at the Cincinnati School of Design under Frank Duveneck, in Munich under Loefftz, and with Boulanger and Lefebvre in Paris. He was most influenced by the Impressionists, and was one of the most consistent exponents of that school among American painters. His landscapes, somewhat unequal in execution, are characterized by a subtle treatment of high-keyed color in delicate tonal effects and by harmony of form and masses. Most of his subjects, apart from the Niagara Falls and Yellowstone series, were taken from the neighborhood of his home in Greenwich, Conn., and among the most charming are some pastel studies. Good examples of his work are to be found in nearly all public collections in America, including the Worcester Art Museum, Metropolitan Museum (New York), Cincinnati Art Museum, Boston Art Museum, Pennsylvania Academy of Fine Arts, etc. In 1913 a comprehensive exhibition of his paintings was held in New York, and in 1915–16 a room was devoted to him at the Panama-Pacific Exposition, San Francisco.

TWAIN, MARK. See CLEMENS, SAMUEL L.

TWAITE. A poor sort of European shad (*Clupea finta*). See ALLICE.

TWANA, twä′nȧ. See SALISHAN STOCK.

TWEED. A river of southern Scotland. It rises in Peebles and flows eastward, emptying into the North Sea at Berwick (Map: Scotland, F 4). It is 97 miles long, but unnavigable, and along its banks much of the tweeds of commerce is made. For 18 miles of its lower course it forms the boundary between England and Scotland, and it flows through one of the most historic regions of Great Britain, the celebrated Borders.

TWEED. A twilled fabric (see WEAVING), often woven in two colors, the yarn being dyed before weaving. It is a soft, flexible, durable material, usually of wool, sometimes of cotton and wool. Its name is derived from the locality where it was first manufactured—in villages along the Tweed, in Scotland.

TWEED, WILLIAM MARCY (1823–78). A notorious American politician, leader of the so-called Tweed Ring, born in New York City. He was the son of a chairmaker, received slight education, and early entered politics, becoming an alderman of New York City in 1850, and taking a seat in Congress in 1853. Subsequently he was a school commissioner, became a member of the board of supervisors of New York County, and was president of the board four successive terms. From 1867 to 1871 he was State Senator. Tweed was grand sachem of Tammany in 1869–71. He was appointed deputy street commissioner in 1861, and when in 1870 that department was changed to the department of public works, he was the commissioner at its head, a position which enabled him to initiate, it was believed, the formation of the combination known as the Tammany Ring, or Tweed Ring. The ring elected its candidate for mayor in 1865, and its candidate for Governor in 1868, and so controlled the Legislature as to secure a modification of the city's charter, greatly increasing the power of the offices held by the ring. Legislators and judges were bribed, bills were passed, and decisions rendered in favor of the members of the ring. Gigantic schemes of city improvement were organized and carried out successfully, though accompanied generally with much peculation. Probably no spoliation so great was ever executed in any country. Its exposure was made largely by the New York *Times*, with the help of a disappointed enemy of the ring, in July, 1871; investigation and prosecution were undertaken by a committee of 70 citizens, under the lead of Samuel J. Tilden (q.v.); and Tweed was indicted in 1872 for forgery and grand larceny. Two trials were held, and in 1873 Tweed was convicted, and sentenced to 12 years' confinement in the penitentiary and to pay a fine of $12,300.18. He was confined on Blackwell's Island from November, 1873, until June, 1875, when he was released by a decision of the Court of Appeals on a legal technicality. He was immediately rearrested on a warrant issued in a civil suit for $6,198,957.85, and sent to Ludlow Street Jail. Being permitted to ride out with an officer, he escaped, and fled to Spain. He was returned in November, 1876, and placed in Ludlow Street Jail until April 12, 1878, when he died. Consult: G. Myers, *History of Tammany Hall* (New York, 1901); J. K. McGuire, *The Democratic Party of the State of New York* (ib., 1905); Bryce, *The American Commonwealth* (new ed., 2 vols., ib., 1910).

TWEED′DALE. See PEEBLESSHIRE.

TWEEDDALE, JOHN HAY, second EARL and first Marquis of (1626–97). A Scottish soldier and statesman. After serving in the King's army (1642) he fought against Charles at Marston Moor (1644), and, four years later, commanded at Preston in the King's army again. He entered Parliament in 1654, became Privy Councilor on the Restoration and President of the Council in 1663, and (1664) was appointed High Commissioner on Ecclesiastical Affairs. He labored for a more lenient attitude towards Covenanters and was removed from office in 1674 by the influence of Lauderdale. He was restored to some of his posts in 1680 and 1682; held office under James II, but, disliking his Scottish policy, joined the Revolution; and in 1689, became Privy Councilor under William and Mary. He was a commissioner on the Glencoe massacre and was dismissed by the King in 1696 for assenting to the Colonization Act and Paterson's Darien schemes.

TWEEDLEDUM AND TWEEDLEDEE. An expression denoting an inappreciable difference between unimportant points. It was used by Byron, satirizing the feud between partisans of Handel and Buononcini.

TWEEDMOUTH, twēd′mŭth, Edward Marjoribanks, second Baron (1849–1909). A British statesman, born in London. He was educated at Oxford, became a barrister in 1874, and was a Liberal member of Parliament for Berwick in 1880–94. In 1886 he was made Comptroller to the Household, and in 1892–94 he was Parliamentary Secretary to the Treasury. In 1894–95 he was Lord Privy Seal and Chancellor of the Duchy of Lancaster, and in December, 1905, became First Lord of the Admiralty. At this time public opinion in Britain was becoming increasingly excited over German rivalry in naval construction, and in March, 1908, it was reported that Tweedmouth, in a correspondence with the German Emperor, had prematurely disclosed certain details of naval estimates before officially communicating them to the House of Commons. The report was untrue, but it led to his resigning from the cabinet in September, 1908. Consult the Countess of Aberdeen (his sister), *Edward Marjoribanks, Lord Tweedmouth, Notes and Recollections* (London, 1909).

TWEED RING. See Tweed, Wm. M.

TWELFTH NIGHT, or What You Will. 1. A comedy by Shakespeare, played at Middle Temple Hall, Twelfth Night, 1602, according to J. Manningham's diary. The principal plot was taken from Bandello's tale, perhaps through Belleforest's *Histoires tragiques*, or B. Rich's *Apollonius and Silla*, adapted from Cinthio's *Hecatommithi*. A similar plot is found in two Italian plays, *Gl' Ingannati* (1537) and *Gl' Inganni* (1592). Malvolio, Sir Toby, Sir Andrew, and the clown are all Shakespeare's. 2. A festival 12 days after Christmas. See Epiphany.

TWELVE, Gospel of the. See Apocrypha.

TWELVE APOSTLES. See Apostles' Islands.

TWELVE TABLES, Law of the. The earlier systematic written statement, or code, of Roman law. According to the Roman tradition, this code was drawn up to appease the plebeians, who complained that the unwritten customary law, as interpreted by patrician priests and applied by patrician judges, gave no adequate protection to their liberties. In 452 b.c. 10 magistrates were elected to write laws (*decemviri legibus scribendis*), and before the end of the following year 10 tables of laws were submitted to and accepted by the popular assembly. In 450 b.c. two supplementary tables were similarly adopted. The decemvirs claimed that they had made the law equal for all, high and low; and there is no doubt that the Roman people regarded the XII Tables with great veneration, as a bulwark of personal liberty.

This code seems to have introduced little if any new law, being substantially a restatement of the older custom. Its rules were simple and were tersely and clearly expressed. It contained no constitutional law, and it dealt mainly with the law of family, property, crimes, torts, and civil procedure. It did not state the law fully even in these matters, for (as in other early codes) rules that were so well settled as to be indisputable were not included.

The XII Tables have come down to us in fragments only. In Roman legal, historical, and grammatical writings, a couple of score of passages are directly cited, and it is sometimes stated in which of the tables the rule stood. Other rules are paraphrased or indicated by allusions. Attempts to reconstruct the code have been made by Gothofredus (1616), Dirksen (1824), Schoell (1866), and Voigt (1883). The text commonly given in works on Roman law is that of Schoell, and citations of table and law by number are regularly based on his reconstruction.

The credibility of the Roman tradition concerning the origin of the XII Tables has been energetically attacked by recent writers, who assert that the tradition is of late origin and that the XII Tables are a private compilation made, probably, in the third century b.c.

Consult: M. Voigt, *Geschichte und System des Rechts der XII Tafeln* (Leipzig, 1883); Edouard Lambert, *Le problem de l'origine des Douze Tables* (Lyons, 1902); Charles Appleton, *Le testament romain: la méthode du droit comparé et l'authenticité des Douze Tables* (Paris, 1903). See Civil Law.

TWES′TEN, August Detlev Christian (1789–1876). A German Protestant theologian. He was born at Glückstadt, studied at Kiel and Berlin, and became professor of theology at Kiel, 1814. In 1835 he succeeded Schleiermacher, whose views he had adopted, at Berlin. He was very influential in the formation of the United Evangelical church of Prussia and was a member of its supreme council until his death. He published *Vorlesungen über die Dogmatik der evangelisch-lutherischen Kirche* (1826–37); *Grundriss der analytischen Logik* (1834); *Matthias Flacius Illyricus* (1844); and edited Schleiermacher's *Ethik* (1841). Consult G. Heinrici, *August Twesten nach Tagebüchern und Briefen* (Berlin, 1889).

TWICH′ELL, Joseph Hopkins (1838–). An American Congregational clergyman, born at Southington, Conn. He graduated at Yale in 1859, was chaplain of the 71st Regiment, New York State Volunteers, during the Civil War, and in 1865 became pastor of the Asylum Hill Congregational Church, at Hartford, Conn. He was one of Mark Twain's most intimate friends. His writings include *John Winthrop* (1891); *Some Old Puritan Love Letters* (1893); *History of the Minisink Country* (1912). Consult, passim, A. B. Paine, *Mark Twain: A Biography* (3 vols., New York, 1912).

TWICKENHAM, twĭk′'n-*am*. A town in

Middlesex, England, on the Thames, connected with Richmond, on the opposite bank, by a substantial bridge, 10 miles southwest of St. Paul's, London (Map: London, F 4). It has interesting historic dwellings, and is a residential district for Londoners. It contains the great church of St. Stephen's, completed in 1874; the estate of Alexander Pope, where the grotto is all that remains (Pope's monument is in the church); Walpole's villa, called Strawberry Hill; and Orleans House, temporarily occupied by Louis Philippe, and still owned by his descendants. Pop., 1901, 21,000; 1911, 29,367. Consult Cobbett, *Memorials of Twickenham* (London, 1872).

TWIG GIRDLER. See Girdler.

TWIGGS, David Emanuel (1790–1862). An American soldier, born in Richmond Co., Ga. In 1812 he was appointed captain in the Eighth Infantry. He served in the War of 1812, and was promoted major in 1814. He later fought against the Seminoles, and then in the Black Hawk War, and was commissioned colonel of the Second Dragoons in June, 1836. For services at Palo Alto and Resaca de la Palma, where he commanded the right wing of General Taylor's army, he was brevetted brigadier general. In the attack on Monterey he commanded a division, was brevetted a major general, and after a short term as Governor of Monterey was sent to join General Scott at Vera Cruz. In the advance on the City of Mexico he commanded the Second Division, led the main attack at Cerro Gordo, and performed important services at Contreras and Churubusco and in the attack on the gates of Mexico. After the war ended he was for some years in charge of the Department of the West and then of that of Texas. On the outbreak of the Civil War he surrendered, without resistance, the United States property under his charge to the Confederates. He was made a major general in the Confederate service and commanded in Louisiana, but age and infirmities led him to leave the service late in 1861.

TWIG PRUNER. Any of several species of longicorn beetles of the genus *Elaphidion*, the females of which lay their eggs in the twigs of several kinds of trees. The eggs hatch and the larva when nearly full grown severs its twig, transforming to pupa within the twig after it has fallen. The common oak pruner (*Elaphidion villosum*) is a slender long-horned beetle, dark brown in color, and covered with grayish pubescence. It feeds in twigs of oak, hickory, chestnut, maple, apple, plum, peach, and other trees. The purpose of the amputation of the twig by the larva seems not primarily to make the twig fall, but to penetrate the wood to the bark for an easy exit. *Elaphidion subpubescens* works in the same way in shoots of white oak, while *Elaphidion mucronatum* is found in twigs of live oak and other trees. The larva of *Elaphidion unicolor* amputates the twigs of the redbud (*Cercis canadensis*). A few other insects have similar habits. For example, certain horntails, notably the willow-shoot horntail (*Phyllœcus integer*), live, in the larval stage, in twigs of willow, which they cause to wilt and break.

TWILIGHT (from *twi-*, combining form of *two* + *light*). The diffused illumination of the sky which immediately precedes sunrise and follows sunset. When the sun sets below our horizon, we are not at once plunged into the darkness of night. There is an intermediate period of partial and slowly increasing darkness which we call twilight. It is caused by the reflection of the sunlight by dust and particles of water vapor in the upper atmosphere. The same phenomenon occurs just before sunrise, and, to distinguish it from the evening twilight, is called dawn. Dawn begins and twilight ends when the sun is about 18° below the horizon, and consequently their duration varies with the latitude and with the season of the year. The higher the latitude the smaller the angle at which the sun's path meets the horizon, and hence the longer it takes the sun to sink to a distance of 18° below the horizon. In the tropics twilight rarely lasts longer than 30 minutes, while in the latitude of the north of Scotland it lasts so long that about midsummer there are several nights on which it fills the entire interval between sunset and sunrise.

TWILIGHT SLEEP. A method of producing amnesia and analgesia (abolition of memory and pain) during childbirth, originating at Freiburg, with Kroenig and Gauss, who developed an exact technique founded on the experiments of Von Steinbuchel, published in 1902. Gauss reported the results of his first 300 cases in 1906, and applied the term *Dämmerschlaf* to this method. The Freiburg technique consists in administering at the beginning of labor an injection of ¼ grain morphine hydrochloride, and $\frac{1}{150}$ grain of scopolamine hydrobromide. At succeeding intervals, depending on the indications, doses of $\frac{1}{450}$ grain of scopolamine alone are given, the intervals between doses being regulated so as to keep the patient in a condition of amnesia. From the first dose the mother must be watched closely as to her pulse, the progress of labor, and the signs of returning memory, and the fetal heart frequently auscultated. When the technique is closely followed by one skilled in its use and in quiet surroundings, it is asserted that it is successful in 75 per cent of the cases; that no harm results to the mother; and that the usual complications of childbirth are not increased. But judging from various reports the method is often ineffective, the mother suffers subsequently from delirium and headache, and the fetus is frequently born in an asphyxiated condition, the terms indicating the various degrees of asphyxia being oligopnea, apnea, and asphyxia.

Several modifications of the procedure have been introduced, perhaps the most notable of which is that of Siegel, an assistant of Kroenig in the Freiburg Frauenklinik. The modification consists in the substitution of narcophine for morphine, narcophine being a combination of morphine with narcotine, through the agency of meconic acid. The drug is supposed to be less dangerous than morphine. In 220 successive cases Siegel reports 88 per cent of complete amnesia, 10 per cent of partial amnesia, and 2 per cent unaffected; 67.6 per cent of the children oligopneic; 1.7 per cent apneic; 1.7 per cent breathed spontaneously; 27.7 per cent were born asphyxiated, half of the latter dying; 1.3 per cent were stillborn. It was noted that it sometimes took 30 minutes to revive some of the partially asphyxiated infants.

Since the discovery of anæsthetics, ether, chloroform, cocaine, laudanum, and many other drugs have been tried for the purpose of ameliorating the sufferings incident to childbirth. Disregarding general anæsthetics, which are always indicated for brief periods during the most difficult stages of labor, a few other methods may be mentioned. In 1896, Savitsky, a Russian physician, said that he had used, with complete success and absence of harm, antipyrine given by rectum. In 1914, Dessaignes, of the French Academy of Medicine, recommended a drug called *antalgesine obstetrique*. This drug was supposedly obtained by the action of chlorhydrate of morphine on living ferments resembling yeast. The drug has been since condemned, and has even been said to consist of nothing more than morphine in solution. Pantopon, a morphine derivative, is extolled by other observers.

In 1914 twilight sleep was popularly exploited in several lay journals and magazines. The accounts were highly colored, and exaggerated the benefits of twilight sleep on the one hand, while magnifying the pain of ordinary parturition on the other. It was even made to appear that children born during twilight sleep were more vigorous, mentally and physically, than their brothers and sisters born under ordinary conditions. The movement among certain classes of women attained almost to the proportions of hysteria, and the medical profession was openly accused of being too indolent and callous to apply the method. The consensus of opinion at present is that twilight sleep is practicable in about 80 per cent of carefully selected cases, that it should be applied only in hospital surroundings or in well-regulated households, and that a physician skilled in its use should be in constant attendance. Its miscellaneous application is bound to result in a large amount of complications, both to mother and child. Consult A. M. Hellman, *Twilight Sleep* (New York, 1915).

TWINFLOWER (*Linnæa borealis*).

TWILLER, Wouter van. See Van Twiller, Wouter.

TWIL′LINGATE or **TOULINGUET,** tōō′lăɴ′gā′. A port of entry on the Twillingate Islands in Notre Dame Bay, on the northeast coast of Newfoundland, 232 miles by steamer from St. John's (Map: Newfoundland, F 3). It is a prosperous fishing centre. Pop., 1901, 3542; 1911, 3348.

TWIN FALLS. A city and the county seat of Twin Falls Co., Ida., 35 miles south of Shoshone, on the Oregon Short Line Railway (Map: Idaho, D 7). The chief industrial establishments are vulcanizing works, flour and planing mills, creameries, sash and door works, lumber yards, a sheet-metal shop, and manufactories of candy, harness, and vinegar. Abundant water power is provided by the Shoshone Falls, 5 miles distant. Pop., 1910, 5258.

TWINFLOWER. A hardy, trailing evergreen plant of the family Caprifoliaceæ. *Linnæa borealis*, the only species, is a favorite in rockeries on account of its dainty, bell-shaped, nodding, pink or white, fragrant flowers, which appear during midsummer in pairs upon erect, slender stems. It thrives best in open, peaty soil and in shade. In the woods it may be found as far south as Maryland and the mountains of California, but is more common northward, being circumpolar and alpine in its distribution.

TWINFLOWER. See Partridge Berry.

TWINING PLANTS. Plants whose axes are coiled about slender supports, as common morning-glory and hop. In most cases the support must be slender (less than 15 centimeters in diameter), though some tropical plants coil about thick tree trunks, and others climb somewhat similarly by partial twining. (See Lianas.) The direction of twining varies with different plants, being either clockwise or counterclockwise. While the direction of twining is usually constant in the same species, some twiners coil in either direction. The direction is not constant, however, among members of the same family, nor even among different species of the same genus.

The cause of twining has long been a difficult problem. The most satisfactory explanation seems to be that twining stems are endowed with a sensitiveness to the action of gravity, which may be distinguished as lateral geotropism (q.v.). The stem at first grows erect (on account of negative geotropism), but through unequal growth, causing nutation (q.v.), soon inclines to one side. At this period of development the flanks (the sides of the stem now on the right and left as distinguished from the upper and lower) are sensitive to their changed relation to gravity (on account of the new horizontal position), which thus becomes a stimulus. The response of the stem to this stimulus is an accelerated growth on one flank, the right or left, as the case may be. The acceleration of growth there swings the horizontal tip towards a new point of the compass, and at the same time, from mechanical necessity, partially rotates the stem on its longitudinal axis, so that a new side is brought into the flank position and therefore under stimulation. It then responds likewise with accelerated growth; this swings the tip still farther around, and again brings a new region under stimulation. By this continued action each side of the stem is successively stimulated, and the tip is therefore swung in a circle. At the same time it is elongating. If, in course of twining, the nearly horizontal tip strikes a support, only the part beyond the support continues to swing, and therefore begins to wrap around the support, forming coils which are at first low and loose. Later negative geotropism again asserts itself in this part of the stem, which grows so that it straightens, if possible, the actual effect being to steepen the coils and make them clasp the support more closely. The slenderer the support, as a rule, the steeper are the completed coils. This explanation receives its strongest support from the fact that when the action of gravity is equalized, as by rotating a seedling twiner on a clinostat (q.v.), no coiling takes place. There are various phenomena of twining, experimentally induced, of which no full explanation can yet be given. There is, however, no mere mechanical stoppage of the swinging tip which permits coiling, because it has no momentum, and because many twiners will coil about a loose cord. It is further probable that twiners are susceptible to the continued contact and pressure of the support, and that this plays some part in the method of climbing which they have adopted.

Twining plants are characterized by unusually long growing regions, and by the retarded development of foliage leaves. Thus, while in erect stems from 10 to 20 centimeters of the apex are still capable of elongation, in twining plants the elongating region is 30 to 50 centimeters long, or in some cases as much as 80 centimeters. The slow development of the foliage leaves seems both to be correlated with this long maintenance of the power of growth, and to be necessary for twining, because the presence of fully developed foliage would interfere seriously with the free movements of the tip.

TWISS, Sir Travers (1809–97). An English jurist and scholar. He was born in Marylebone, London, graduated from University College, Oxford, with distinction, and published in 1836 his *Epitome of Niebuhr's History of Rome*. In 1840 he was called to the bar. From 1842 to 1847 he was professor of political economy at Oxford, from 1852 to 1855 professor of international law at King's College, London, and from 1855 to 1870 held the regius professorship of civil law at Oxford. He also held several ecclesiastic legal positions, and in 1858 he became chancellor of the diocese of London, the same year having been created Queen's counsel. In 1867 he was appointed Queen's Advocate-General and was knighted. Owing to a scandalous libel of which he and his wife were the victims, in 1872 he retired to private life and devoted himself to juridical science and literature. In 1884 he drafted for the King of Belgium a constitution for the Congo Free State, and in 1884–85 was counsel extraordinary to the British Embassy during the Berlin Conference. His chief works are: *View of the Progress of Political Economy in Europe since the Sixteenth Century* (London, 1847); *The Oregon Territory: Its History and Discovery* (New York, 1846); but his fame rests principally on his treatise, *The Law of Nations* (1861–63).

TWITTER. A peculiar deformation of carnation plants, produced possibly by several kinds of insects: a plant louse or green fly of the genus *Siphonophora*, a true thrips and possibly the larva of some anthomyiid fly. Carnation twitter may be produced by any cause which checks the growth of the plant; hence any one of several insects may be involved.

TWO GENTLEMEN OF VERO'NA, The. A comedy by Shakespeare, probably produced in the original form in 1591, and in the present form in 1595; first printed in the folio of 1623.

TWO HARBORS. A city and the county seat of Lake Co., Minn., 28 miles northeast of Duluth, on Lake Superior, and on the Duluth and Iron Range Railroad (Map: Minnesota, F 3). It is one of the largest of the iron-ore shipping points, and also makes large shipments of lumber and pulp wood. Pop., 1900, 3278; 1910, 4990.

TWO NOBLE KINSMEN. A play produced in 1625 and published in 1634 as the work of Fletcher and Shakespeare. It was probably written by Massinger and Fletcher with Rowley.

TWO RIVERS. A city in Manitowoc Co., Wis., 7 miles northeast of Manitowoc, on Lake Michigan, and on the Chicago and Northwestern Railroad (Map: Wisconsin, F 4). The leading manufactures are dentists' and printers' cabinets, wood type cases, office furniture, aluminium novelties, gasoline engines, tubs, pails, veneer goods, and knitted goods. Pop., 1900, 3784; 1910, 4850.

TWO-SEED-IN-THE-SPIRIT BAPTISTS. See Baptists.

TWO SICILIES, Kingdom of the. The name commonly given to a former kingdom embracing Sicily and southern Italy, and known often as the Kingdom of Naples. In the Middle Ages the southern part of the Italian mainland came to be known as "Sicily on this side of the Faro" (the Strait of Messina). From the earliest times both island and mainland were subject to settlement and conquest by peoples of widely different stock, producing a complicated admixture of races. At the dawn of history the Phœnicians had trading settlements there. In the eighth century B.C. numerous Greek colonies were founded in both Sicily and southern Italy and became powerful and wealthy states. A new Phœnician element was introduced when Carthage disputed the supremacy of Sicily with the Greeks. The Roman conquest followed. In the middle of the fifth century, at the time of the fall of the Roman Empire, Sicily was ravaged by the Vandals. Towards the close of the century the Ostrogoths made themselves masters of Italy and Sicily. In the sixth century their realm was conquered by the Byzantines. Soon after the Lombards established their sway over part of southern Italy. The Lombard Duchy of Benevento was founded, out of which in the ninth century arose the three principalities of Benevento, Salerno, and Capua. By the side of these was the Duchy of Naples, a Byzantine creation. Apulia and Calabria were held by the Byzantines until the eleventh century. In the years from 827 to 878 the island of Sicily was conquered by the Saracens, and they also obtained a foothold on the mainland.

About 1037 the sons of a Norman knight, Tancred de Hauteville, setting out with a few followers, entered southern Italy in the service of the Byzantine Governor, but soon seized and divided Apulia and were able to hold the country against every effort of the Greeks to dislodge them. Robert Guiscard, one of these brothers, became Count of Apulia in 1057, and in 1059 he was recognized by Pope Nicholas II as Duke of Apulia and Calabria. In 1061 his younger brother, Roger, with a few hundred Norman knights, began the conquest of the island of Sicily, which became a county and a fief of Robert's duchy, though the total subjugation of the island was not accomplished till 1090, after Robert's death. In 1127 Roger II, son of the first Roger, united Apulia, Calabria, and Sicily, and in 1130 assumed the title of King of Sicily. He ruled over the Abruzzi, made himself master of Capua, and received the submission of Naples. The marriage of Frederick Barbarossa's son, the later Emperor

Henry VI, to Constance, heiress of the Two Sicilies, in 1186, united the destinies of the Norman Kingdom with those of the house of Hohenstaufen, whose rule began in 1194. The child of this marriage, the Emperor Frederick II (q.v.), was the most remarkable prince in the Europe of his day. He reorganized the government of the Sicilian Kingdom on essentially modern lines, founded the University of Naples, and made his court a brilliant centre of high culture and learning. His death in 1250 was followed by the downfall of the Hohenstaufens. In 1266 Charles of Anjou, brother of Louis IX of France, at the instance of the Pope, undertook the conquest of the Two Sicilies. He vanquished Manfred, son of Frederick II, at Benevento, and in 1268 captured and executed Conradin, the last of the Hohenstaufens. Charles of Anjou made Naples his residence.

The year 1282 witnessed the fearful popular uprising against the French in Sicily known as the Sicilian Vespers (q.v.). The people shook off the yoke of Anjou and placed their island under the rule of Pedro III of Aragon. The house of Anjou continued to rule in south Italy, which thus became the Kingdom of Naples. In 1296 Sicily was separated from Aragon, but continued under the rule of the Aragonese house, and in 1412 was reunited with that kingdom. Robert I of Naples (1309–43) made himself the champion of the Guelph party and extended his influence throughout Italy. He was succeeded by his granddaughter Joanna I (q.v.), and an anarchic period began and continued for many years, the heirs of the elder Neapolitan line, which had also acquired the throne of Hungary, contending with new aspirants from Anjou. In 1399 the Neapolitan line triumphed in the person of the crafty and unprincipled Ladislas (q.v.). He died in 1414, leaving the kingdom to his sister, Joanna II (q.v.). She was given up to sensuality, and disorder was renewed. After her death in 1435 Alfonso V, King of Aragon and Sicily, undertook the conquest of Naples, of which he secured possession in 1442, reigning until his death in 1458. He left Aragon and Sicily to his eldest son, John, and Naples to his illegitimate son, Ferdinand, under whose rapacious and cruel rule new troubles arose. In 1495 Charles VIII of France invaded Naples, and although he was compelled to withdraw in the same year, his successor, Louis XII, jointly with Ferdinand of Spain, conquered the country in 1501. Two years afterward the Spaniards under Gonsalvo de Córdoba (q.v.) drove out the French and made Naples a Spanish province.

The country was now subjected to the oppression of Spanish viceroys. Rebellion at Naples broke out in 1647 under Masaniello (q.v.). In 1707 the Neapolitan dominions were wrested from Spain by Austria during the War of the Spanish Succession. (See SUCCESSION WARS.) Naples was confirmed to Austria by the Treaty of Utrecht (1713) and Sicily was given to Savoy. In 1720 Sicily was transferred by Savoy to Austria in exchange for Sardinia. In 1734 Don Carlos, second son of Philip V of Spain, of the house of Bourbon, and Elizabeth Farnese invaded the Two Sicilies, and in 1735 he was crowned and was recognized by the Treaty of Vienna as King Charles III. (See CHARLES III, King of Spain.) After the Peace of Aix-la-Chapelle (1748) Italy enjoyed nearly a half century of peace, and these years witnessed in the Two Sicilies progress along many lines, but the upheaval of the French Revolution brought new troubles. The coalition against the French Republic was joined by Ferdinand, the second Bourbon King of the Two Sicilies. (See FERDINAND I.) In December, 1798, the Neapolitans attempted to drive the French out of the Papal States. They were thrown back, Naples was taken (January, 1799), and the Parthenopean Republic was created. In the same year Ferdinand was reinstated with the assistance of the English fleet. In 1896 Napoleon conquered the Kingdom of Naples and placed his brother Joseph Bonaparte on the throne, Ferdinand continuing to reign in Sicily. In 1808 Joseph was succeeded by Joachim Murat (q.v.). After the fall of Murat in 1815 Ferdinand was restored in Naples. At the close of 1816 Ferdinand united the kingdoms of Naples and Sicily into the single kingdom of the Two Sicilies and changed his title from Ferdinand IV to Ferdinand I.

In 1820 there was a military rising in the Neapolitan dominions, joined by the Carbonari (q.v.), under the leadership of General Pepe, to secure a constitutional government. The King yielded to the demand, notwithstanding his agreement with Austria to make no constitutional concessions. At the same time a revolutionary movement aiming at autonomy for the island took place in Sicily. The congress of the Great Powers at Laibach (1821) charged Austria with the restoration of Ferdinand's absolute power. The patriots made an ineffectual resistance and Ferdinand resumed his tyrannical sway under the protection of Austrian bayonets. Ferdinand died in 1825 and was succeeded by his son, Francis I (q.v.), who in 1830 was succeeded by his son Ferdinand II (q.v.). The change of rulers brought about no change in the despotic policy of the government. After 1843 the republican propaganda of Mazzini took a strong hold in southern Italy. At the beginning of 1848 Sicily rose in insurrection to secure an autonomous and constitutional government. Ferdinand II was forced to grant a representative constitution to his subjects. This did not satisfy the Sicilians. The deposition of Ferdinand was declared, a provisional government organized, and the Duke of Genoa, son of the King of Sardinia, was elected King of the Sicilians (June, 1848), a dignity which he declined. In his Neapolitan dominions Ferdinand, with the aid of reactionary elements, was enabled successfully to combat the revolutionary movement now sweeping through Italy. In September, 1848, his forces entered upon a Sicilian campaign. In May, 1849, Palermo capitulated and the revolution in the island ended. Ferdinand, once more the despot, wreaked a fearful vengeance upon the champions of liberty in his dominions. His atrocities were finally checked by the intervention of England. In 1859 Ferdinand II was succeeded by his son, Francis II. The emancipation of northern Italy (except Venetia) from the rule of Austria and the tyrants upheld by her (1859–60) was speedily followed by the liberation of the Two Sicilies from the Bourbons, accomplished through the efforts of Garibaldi, and by their incorporation in the new Kingdom of Italy (1860–61). See GARIBALDI; ITALY; VICTOR EMMANUEL II.

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TY. See Tyr.

TYA'NA, Apollonius of. See Apollonius of Tyana.

TYBEE (tī'bē) **ISLAND.** An island at the mouth of the Savannah River, Georgia (Map: Georgia, F 4). It is historically noted as the site of the batteries erected by General Gillmore in 1861 for the reduction of Fort Pulaski, which capitulated April 11, 1862. At the north end of the island stands a lighthouse of the first order, 144 feet high, lighting the Tybee Roads, from which a channel protected by jetties leads up to Savannah.

TY'BURN. The chief place of execution in London prior to 1783, frequently mentioned in English history and literature. It was near the northeast corner of Hyde Park, at the western extremity of Oxford Street, and about where the Edgeware and Uxbridge roads unite, near the present Marble Arch. It was named from a small stream which ran from Hampstead to the Thames through St. James's Park. Wooden galleries were erected near the gallows for the accommodation of spectators. The criminal was conveyed from Newgate (q.v.) to Tyburn (about 2 miles) by Holborn and the Tyburn Road, now Oxford Street. As Oxford Street and London spread westward, the long procession became inconvenient, and the place of execution was, in 1783, removed to the Old Bailey, or Newgate. Under parliamentary statute prosecutors who secured a capital conviction against a criminal were exempted from all manner of parish and ward "offices within the parish in which the felony had been committed," and obtained what was called a Tyburn ticket, which was enrolled with the clerk of the peace, and sold like any other property. The privileges the tickets conferred were greatly valued, as they sold at a high price. Consult Alfred Marks, *Tyburn Tree: Its History and Annals* (London, 1908).

TYCHE, tī'kē. See Fortuna.

TYCHO BRAHE, tē'kō brä'ĕ *or* brä. See Brahe.

TYCHO'NIUS, or **TICHONIUS** (?–c.400). A Donatist writer. He was born in Africa, headed a party among the Donatists, and defended their position. Of his writings those of most interest are his biblical works, a commentary on the Revelation and especially his *Liber Regularum.* The latter has been edited by F. C. Burkitt, *The Book of Rules of Tychonius* (Cambridge, 1894), and has great interest as the first attempt at a system of hermeneutics.

TYCHSEN, tĭk'zen, Olaus Gerhard (1734–1815). A German Semitic scholar. He was born at Tondern, Schleswig, studied at Halle, and taught in the orphan asylum there. In 1759–60 he traveled through Germany and Denmark as a missionary to the Jews. In 1760 he went to the newly founded University of Bützow, where he was professor of Oriental languages from 1763 till the university was closed in 1789. He then became librarian at Rostock. Tychsen is especially noted for his knowledge of Rabbinic literature and Jewish history and for his work in Arabic paleography; he also attempted to decipher the cuneiform inscriptions. He published *Bützowische Nebenstunden* (1766–69); *Physiologus Syrus* (1795); *Historia Monetæ Arabicæ* (1797); and *Tractatus de Legalibus Arabum Ponderibus ac Mensuris* (1800), the treatise of Makrizi. For his biography, consult A. T. Hartmann (Bremen, 1818–20).

TYCOON, or **TAIKUN,** tī'kōōn' (Jap. *taikun,* great prince, from Chin. *ta,* great + *kiun,* prince). A title formerly applied to the Shogun of Japan by foreigners. It dates from the early days of Occidental intercourse with the Japanese people.

TYD'EUS (Lat., from Gk. Τυδεύς). In Greek mythology, son of Œneus and Periboea. As a result of a murder he was forced to flee from his father's Kingdom of Calydon and married Deipyle, daughter of Adrastus (q.v.), King of Argos. He went with Adrastus against Thebes, where he slew Melanippus, who had wounded him. When Athena came to him with a remedy which would have made him immortal, Amphiaraus (q.v.) brought him the head of Melanippus. Tydeus devoured a part of it, and the goddess, in disgust, abandoned him.

TYE, Christopher (c.1497–1572). An English organist and composer of considerable note in the sixteenth century. He became a chorister, and in 1536 a gentleman of the Chapel Royal. Under Elizabeth he was organist of the Chapel Royal, and produced many services and anthems, some of which continue to be sung in England. Some of them show a marked originality and variety of treatment. He also translated the first half of the Acts of the Apostles into English verse, and then set it to music of generally excellent quality. He seems to have taken orders and to have held two or three parishes in the neighborhood of Cambridge.

TY'ERMAN, Luke (1820–89). An English Wesleyan minister and biographer. He was born at Osmotherly, Yorkshire, entered the ministry in 1842, and continued to preach until 1864, when he retired and devoted himself to literary work. He published: *The Life and Times of Rev. Samuel Wesley* (1866); *The Life and Times of Rev. John Wesley* (1870–71); *The Oxford Methodists* (1873); *The Life of Rev. George Whitefield* (1876); *Wesley's Designated Successor: The Life, Letters, and Literary Labors of Rev. John William Fletcher* (1883).

TYIGH, tī'ĭg. See Warm Springs.

TYLDESLEY (tĭlz'lĭ) **WITH SHAKERLEY,** shăk'ẽr-lĭ. A town in Lancashire, England, 10 miles northwest of Manchester. Its modern growth is due to its cotton manufactures and neighboring collieries. Pop., 1901, 14,843; 1911, 15,582.

TY'LER. A city and the county seat of Smith Co., Tex., 105 miles by rail east by south of Dallas, on the St. Louis Southwestern and the International and Great Northern railroads (Map: Texas, E 3). It has Tyler College, a commercial and literary institution, and Texas College (Methodist) for colored youths. Noteworthy also are the city hall, the Carnegie library, the Federal court and post-office building, the Court of Criminal Appeals building, and the St. Louis Southwestern Railroad Hospital. There are two parks—Bellevue and Lakewood. Tyler derives considerable importance from its situation in a fertile region producing large quantities of fruit, vegetables, and cotton. A box and crate factory, an oil mill, a compress, mattress and overall factories, a fruit and vegetable cannery, a pottery, and railway shops are the leading industrial establishments. In 1914 the city adopted the commission form of government. Tyler was settled about 1844, and was first corporated about 1850. Pop., 1900, 8069; 1910, 10,400; 1915 (U. S. est.), 11,629.

TYLER, Bennet (1783–1858). An American Congregational minister and educator. He was born at Middlebury, Conn., graduated at Yale College (1804), and was pastor at South Britain, Conn., president of Dartmouth College (1822–28), pastor at Portland, Me., and from 1834 till his death was first president and professor of theology in a theological seminary at East Windsor Hill, Conn. (This was removed to Hartford in 1865 and was thereafter known as Hartford Theological Seminary.) He published: *History of the New Haven Theology* (1837); *Treatise on the Sufferings of Christ* (1845); *A Treatise on New England Revivals* (1846); *Letters to Dr. H. Bushnell on Christian Nurture* (2 series, 1847–48); *Lectures on Theology* (posthumous, with memoirs by his son-in-law, Rev. Dr. Nahum Gale, Boston, 1859). Consult Williston Walker, *New England Leaders* (New York, 1901). See New England Theology.

TYLER, Daniel (1799–1882). An American engineer and soldier, born at Brooklyn, Conn. He graduated in 1819 at West Point, and in 1824–26 served at the Fortress Monroe School of Artillery Practice. In 1828–29 he was in France, studying artillery methods, in 1830–34 was on ordnance duty, and in the latter year resigned. He was contracting engineer and president of several railways until the Civil War, when he became colonel of the First Connecticut Volunteers, and was soon afterward commissioned brigadier general. Having been mustered out, he was in 1862 reappointed with rank of brigadier general, and participated in the Mississippi campaign and also in the siege of Corinth. In 1863 General Tyler commanded the Union forces at Harper's Ferry and Maryland Heights.

TYLER, John (1790–1862). The tenth President of the United States. He was born at Greenway, Charles City Co., Va., March 29, 1790, the son of Judge John Tyler, who was Speaker of the Virginia House of Delegates, Governor of Virginia, and a judge of State and Federal courts. The son graduated at William and Mary College in 1807; was admitted to the bar in 1809; and became a member of the Legislature in 1811, where he acted with the Republicans and supported the war with Great Britain. He was elected to the Legislature five times in succession until 1816, when he went to Congress. In the House of Representatives, during the Fourteenth and Fifteenth Congresses, he acted with the States-Rights Republicans, condemned General Jackson's course in Florida, and opposed the United States Bank and the Missouri Compromise. In 1823 he was again a member of the Virginia Legislature. In 1825 he was elected Governor of Virginia by the Legislature, and was unanimously reëlected the following year. At the close of his second term as Governor he was elected over John Randolph to the United States Senate, in which he opposed the tariff measures of 1828 and 1832, opposed nullification, but condemned Jackson's nullification proclamation, although he supported Jackson for the presidency in 1832 and stood alone among the Senators in voting against the Force Bill of 1833. He was chosen for a second term in the Senate, and in 1834 made a report censuring President Jackson for removing the deposits from the United States Bank, and voted for Clay's resolution of censure. Having subsequently been instructed by the Legislature of Virginia to vote for the expunging of the resolution of censure, he refused to obey, and in February, 1836, resigned his seat and retired to private life. Tyler was a leading member of the new Whig party, and an unsuccessful candidate for the vice presidency in 1836. In 1840 he was elected Vice President on the Whig ticket with General W. H. Harrison (q.v.). President Harrison died April 4, 1841, one month after his inauguration, and was succeeded by Tyler, who completely broke with the party that had elected him. He vetoed the bill to recharter the Bank of the United States, and when it was modified partly in accordance with his suggestions and repassed he vetoed it again. The bill to revise the tariff met a similar fate. Thereupon, on Sept. 11, 1841, all the members of the cabinet except Webster, who was then engaged in negotiations with Great Britain concerning the boundary between the United States and Canada, resigned, and a year later Webster followed. Shortly thereafter some of the leading Whigs issued a public address declaring that "all political connection with them and John Tyler was at an end from that day henceforth." The chief events of Tyler's administration were the conclusion of the Webster-Ashburton Treaty (q.v.) with Great Britain and the annexation of Texas. In 1845 he retired to his estate in Charles City Co., Va., where he remained until 1861, when he was called to preside over the Peace Convention at Washington. Failing in his efforts at compromise, he gave his adhesion to the Confederate cause, voted for secession in the Virginia convention, served in the Confederate Provisional Congress, and was elected to the Confederate House of Representatives, but died at Richmond, Jan. 18, 1862, before he could take his seat. Consult: L. G. Tyler, *The Letters and Times of the Tylers* (3 vols., Richmond, 1884–96); J. F. Rhodes, *History of the United States* (New York, 1910); J. G. Wilson, *Presidents of the United States*, vol. ii (ib., 1914). For a more detailed account of the events of his administration, see the section on *History* in the article United States.

TYLER, John Mason (1851–). An American biologist and author. He was born at Amherst, Mass., graduated in 1873 from Amherst College, and after studying at Union Theological Seminary and at Göttingen and Leipzig, returned to his Alma Mater as instructor, becoming Stone professor of biology in 1882. His publications include: *The Whence and the Whither of Man* (1897); *Growth and Education*

(1907); *Man in the Light of Evolution* (1908); *The Place of the Church in Evolution* (1914).

TYLER, Lyon Gardiner (1853–). An American educator, son of President Tyler, born at Sherwood Forest, Va. He graduated in 1875 at the University of Virginia, studied law, and in 1877–78 was professor of belles-lettres at William and Mary College. In 1878–82 he was principal of Memphis Institute, in 1882–88 practiced law at Richmond, Va., and in 1887 was a member of the Virginia House of Delegates. In 1888 he became president of William and Mary College. His publications include: *The Letters and Times of the Tylers* (3 vols., 1885–96); *Parties and Patronage in the United States* (1891); *The Cradle of the Republic* (1900; 2d ed., 1906); *England in America* (1904); *Williamsburg, the Old Colonial Capital* (1907); *The Cavalier in America* (1913). He edited the *Narratives of Early Virginia, 1606–1625* (1907) and *Encyclopedia of Virginia Biography* (5 vols., 1915).

TYLER, Moses Coit (1835–1900). An American literary historian and educator, born at Griswold, Conn. His parents removed to Michigan, where he began his education. He graduated at Yale in 1857 and, after studying theology there and at Andover, had Congregational pastorates at Owego and Poughkeepsie, N. Y. He resigned the latter charge in 1862, from ill health, and went to England, where he spent four years of rest, studying, lecturing, and writing. In 1867 he became professor of English at the University of Michigan, and in 1881 was called to the chair of American history at Cornell, holding this until his death. In 1881 he was ordained deacon in the Protestant Episcopal church and was advanced to the priesthood in 1883. He published his *History of American Literature during the Colonial Time* (2 vols.) in 1878, and won a wide reputation for scholarship. This history, which was continued in the two volumes entitled *A Literary History of the American Revolution* (1897) and, in a measure, in the essays entitled *Three Men of Letters* (Bishop Berkeley, President Dwight, and Joel Barlow, 1895), constitutes Professor Tyler's chief claim to remembrance. It hardly carries the story of American literature beyond the year 1783, but within its limits is characterized by such accuracy and breadth of scholarship that it is not likely to be superseded, and fully entitles its author to a high place among literary historians.. It is somewhat diffuse and fails to apply standards rigorously. Besides this history, Tyler's most important work is a biography of Patrick Henry in the *American Statesmen Series* (1888). He also published *The Brawnville Papers* (1868), devoted to the claims of physical culture; a revision of H. Morley's *Manual of English Literature* (1879); *Memorial of E. K. Apgar* (privately printed, 1886); and *Glimpses of England* (1898), a collection of letters from England. Consult W. P. Trent in the *Forum* (New York, August, 1901), and G. L. Burr in *Report of the American Historical Association*, vol. i (ib., 1901), and *Moses Coit Tyler: Selections from his Letters and Diaries*, edited by J. T. Austen (Garden City, N. Y., 1911).

TYLER, Ransom Hebbard (1813–81). An American legal author, born in Leyden, Mass. He studied law, and was admitted to the New York bar. He was elected district attorney and county judge for Oswego County. An extensive traveler, he was also editor of the Oswego *Gazette* and contributed to periodicals. He published *The Bible and Social Reform* (1863), and important legal works, among them: *American Ecclesiastical Law* (1866); *Usury, Pawns or Pledges, and Maritime Loans* (1873); *Fixtures* (1877); *Infancy and Coverture* (2d ed., 1882).

TYLER, Royall (1757–1826). An American jurist and author, born in Boston. He graduated at Harvard College in 1776, studied law under John Adams, and was for a time aide to General Benjamin Lincoln, serving in the Revolution and in Shays's Rebellion in 1786. In 1790 he removed to Vermont, became a judge of the Supreme Court in 1794, and was Chief Justice from 1800 to 1806. His chief legal work was *Reports of Cases in the Supreme Court of Vermont* (1809–10). He wrote several clever and successful plays, of which one, *The Contrast*, a comedy partly in Yankee dialect, presented in New York in 1786, was the first American comedy produced by a professional dramatic company. Other plays were *May Day* and *The Georgia Spec.* He also contributed light, witty verse to periodicals. Tyler's *Contrast* was published in 1790 and reissued in 1887 by the Dunlap Society, with an introduction by T. J. McKee. Some of his work may be found in *The Spirit of the Farmer's Museum* (1801), for he helped Joseph Dennie (q.v.) to make *The Farmer's Museum* a success, and also in Dennie's late newspaper, *The Portfolio*, of which Tyler's literary criticism was a feature.

TYLER, Wat (?–1381). The principal leader of the English social revolt of 1381. Owing to the fact that he was captain of the Kentish insurgents, he is generally supposed to have been a Kentishman; but he was from Colchester in Essex. He should not be confounded with his colleague, Jack Straw, captain of Essex. The usual supposition drawn from his name, that he was a tiler by trade, is not certain, since a surname of the fourteenth century does not necessarily indicate trade. Nothing is known of his life previous to the revolt. Unfavorable estimates of his character are based upon the hostile and unreliable testimony of Walsingham and Froissart. Even hostile sources are agreed as to his ability. His part in the organization of the revolt was second only to that of John Ball, and he was certainly the chief factor in conducting it. The peasants' levies were summoned in his name, and important questions were submitted to his personal decision. On special occasions he acted as spokesman of the insurgents, presenting their demand to the King. The extent of his importance as a leader is shown by the entire collapse of the revolt after his murder at Smithfield. See Tyler's Rebellion.

TYLER'S REBELLION. The name usually applied to the English social revolt in 1381, from Wat Tyler, its chief leader. It had been prepared for years by the teaching of a priest, John Ball (q.v.), in southern and eastern England, and from his home at Colchester it was silently organized throughout Essex, and thence in the adjoining counties, especially Middlesex, Sussex, and Kent. The determination of the government to punish those who by false returns had attempted to avoid payment of an oppressive poll tax greatly incensed the people and gave occasion for the outbreak in Essex in the early part of June, 1381. The country was soon aflame, and a division under Wat Tyler and Jack Straw crossed the Thames at Erith. After capturing the castle of Dartford, where Tyler was chosen leader, and securing the allegiance of the mayor and council of Canterbury, they marched on London. On June 12 they camped at Blackheath, a southeastern suburb, while the Essex men, under Jack Straw, gathered at Mile End. Bands of insurgents, from near and distant counties, marched on London, Corpus Christi (June 13) being the day chosen.

Disappointed in a promised conference at Blackheath with the young Richard II, whom the Council would not permit to land from his barge in the Thames, the insurgents on June 13 marched on London. The London populace and the powerful Fishmongers' Company sided with them, and both the southern and northern armies were admitted into the city. The former straightway invested the Tower of London, in which the King, his Council, and many of the nobility had taken refuge. In vain did Richard try to calm them from a turret; yielding to their threats, the Council agreed to the King's meeting them on the following morning at Mile End.

The traditional account of this conference, based on Froissart, represents the boy King by courage calming the insurgents and inducing them to disperse. In reality it was a conference between the timid lad and the leaders, with Tyler as spokesman, in presence of the entire rebel army. The King listened to Tyler's harangues, graciously granted all their demands, and then retired to the Tower Royal, another London fortress. The insurgents' demands included the abolition of serfdom, a maximum rent of fourpence the acre for lands thus freed, the right to buy and sell free of toll all over England, and the abolition of the Statutes of Laborers, by which wages had been fixed in the interests of the landlords and master craftsmen. The King also agreed to let them execute his ministers, and promised in future to choose his councilors from among the insurgents.

By virtue of this grant, the commons marched straightway to the Tower, seized and beheaded such of the ministers as they could secure—Simon Sudbury, who was Archbishop of Canterbury and Chancellor, and Sir Robert Hales, the Treasurer, besides a few others, among whom were four collectors of the poll tax. Meanwhile a large number of the insurgents returned home, satisfied with the abolition of villeinage. But the most formidable division, under Tyler, Straw, and Ball, remained, demanding further economic concessions, and above all the reformation of the Church, in accordance with Ball's ideals. The King agreed to meet them at Smithfield at vespers of June 15. Here, too, the traditional account has given glamour to the heroism of Walworth, Mayor of London, and the boy King. In reality, Tyler was lured out of sight of his men, and, granting his demands, a pretext was found to arrest him, in resisting which he was dispatched by Walworth and other royal retainers. Their demands having been satisfied, the rebels were induced to go to St. John's Field, as they supposed, at Tyler's command. When they learned the truth, and saw the royal forces approaching, they were glad to disperse, retaining the charters of freedom granted at Mile End.

The demands of the insurgents at Smithfield include two legal requirements directed especially against the Statute of Laborers, one against serfdom, and a fourth demanding free use of woods, hunting and fishing to all tenants of manors. Their demands for the reformation of the Church differ from others of a later period in that the confiscation of Church property accrues to the benefit of the common people, instead of King or nobility, by enfranchising the tenants of clerical domains and decreasing clerical taxes. The reforms were the most democratic ever demanded.

Though the political and economic aspirations of the peasantry formed the backbone of the revolt of 1381, there were other important factors. The lower classes of the towns sympathized with the insurgents. In some cases the city governments, like Canterbury and Bridgewater in the south and York, Scarborough, and Beverley in the north, were implicated. A very important factor was a general uprising against the monasteries, both of tenants and especially of mesne towns. At St. Albans, both townsmen and peasants extorted charters of liberties. There were movements at Reading, Dunstable, and other smaller foundations; at Cambridge there was an uprising against the university. In Sussex matters centred in a fierce revolt against Abbey St. Edmunds, the prior of which was beheaded. John Wrawe, the captain of the county, was a priest, as were others of the leaders. In Norfolk the plundering was especially severe; under the leadership of Geoffrey Lister and Sir Roger Bacon, ambassadors with a large sum of money were sent to the King to obtain the liberties desired. All of these local outbreaks were connected with the central movement. There was less plundering than might have been expected, and violence was usually directed against persons connected with the government or local oppressions, and especially those known as adherents of John of Gaunt. After the rebels had retired, the remnants of the revolt were stamped out with great severity; the liberties granted were everywhere revoked, and the reaction was far bloodier than the revolt. The effect of the movement was to abolish for the time the poll taxes, to do away practically with the Statute of Laborers, and to hasten the general tendency towards the abolition of villeinage.

Consult: George Kriehn, in *American Historical Review*, vol. vii (New York, 1902); Edgar Powell, *The Rising in East Anglia in 1381* (Cambridge, 1896); André Réville, *Soulèvement des travailleurs d'Angleterre en 1381* (Paris, 1898); G. M. Trevelyan, *England in the Age of Wycliffe* (London, 1899); id., *The Peasant Rising and the Lollards* (ib., 1899); Charles Oman, *The Great Revolt of 1381* (Oxford, 1906).

TYLOP'ODA (Neo-Lat. nom. pl., from Gk. τύλος, *tylos*, knob, knot, callus + πούς, *pous*, foot). A section of the Ruminantia, which embraces the Camelidæ, distinguished by the padded character of the soles of the feet. See CAMELIDÆ.

TY'LOR, SIR EDWARD BURNETT (1832–). An English anthropologist, born in London. After a year's travel in the United States, he went to Mexico in 1856 with Henry Christy and in 1859 published his observations in *Anahuac, or Mexico and the Mexicans*, notable for accuracy of description. In 1865 *Researches into the Early History of Mankind* appeared; in 1871 he published *Primitive Culture*, in 1881 *Anthropology*, and in 1900 *The Natural History of Religion*. These works exerted a profound influence on the development of anthropological science. Tylor's most important scientific contribution is his treatment and development of the doctrine of animism as the fundamental and universal factor in primitive religions. (See Animism; Religion, Comparative.) From 1896 till his retirement he was the first professor of anthropology at Oxford. He was knighted in 1912.

TYLO'SIS (from Gk. *τύλος*, *tylos*, knob, knot, callus). A protusion of a living cell through a pit in a large pitted vessel, due to the pressure in the cell. Often the nucleus and some of the protoplasm passes through the pit into the tylosis, and in this case cell division may take place until the cavity of the vessel is entirely filled with the growing tissue. Sections of the stem of the Virginia creeper (*Ampelopsis quinquefolia*) show tyloses in which cell division has taken place until the cavities of the vessels are nearly closed.

TYMMS, T. Vincent (1842–). An English Baptist clergyman. He was born in London, and studied at Regent's Park College in that city. From 1869 to 1891 he served as minister of the Downs Chapel, Clapton, London, and thereafter until 1904 was president of the Baptist College, Rawdon, Leeds, holding also the chair of theology. He served as president of the Baptist Union of Great Britain in 1896. In 1903 he was Angus lecturer at Regent's Park College. His publications include: *The Christian Idea of Atonement* (1904); *The Private Relationships of Christ* (1907); *The Evolution of Infant Baptism and Related Ideas* (1912); *The Cameroons (West Africa): A Historical Review* (1915).

TYMPANITES, tĭm'pan-ī'tēz. A disease of horses and cattle. See Bloat and Horse.

TYM'PANUM (Lat., from Gk. *τύμπανον*, drum). In anatomy, the middle ear. (See Ear.) In architecture, (*a*) the flat space inclosed within the sloping and horizontal cornices of a pediment; usually in classic and neoclassic examples, filled with sculpture. (*b*) The flat space inclosed between the spring and intrados of a recessed arch, or between the arch and lintel of a door or window set within or under it. In mediæval architecture it was often adorned with mosaic, inlay, or relief sculpture.

TY'NAN, Katharine. See Hinkson, Mrs. Katharine.

TYNDALE, tĭn'dal, William (?–1536). An English translator of the Bible. He was born on the borders of Wales, between 1490 and 1495, and was educated at Oxford and Cambridge. After leaving Cambridge (about 1522) he became tutor and chaplain in the home of Sir John Walsh, a knight of Gloucestershire. He preached frequently and, his opinions differing from those of the clergy of the neighborhood, he became involved in religious dispute, and an accusation was made against him before William of Malvern, chancellor of the diocese, who censured him for his boldness and indiscretion. As a result of his experience, Tyndale became determined to translate the New Testament into English. He went to London in 1523, but, failing to obtain help, he retired to Germany the following year. The New Testament was printed at Worms in 1525 and carried to England, and, though denounced by the government, several reprints were produced within the next few years. Tyndale remained on the Continent writing tracts in advocacy of the reformed doctrines. His chief original work, *The Obedience of a Christian Man and How Christian Rulers Ought to Govern*, appeared in 1528. In 1530 he published a translation of the Pentateuch, and in 1531 one of the Prophet Jonah. During this period Tyndale associated with Luther, John Frith, Patrick Hamilton, John Rogers (qq.v.), and other leading reformers. He adopted the Zwinglian doctrine of the Lord's Supper, and separated himself from the other English reformers by opposing the divorce of Henry VIII from Catharine of Aragon. He was the subject of much annoyance from the authorities and changed his abode from time to time. In 1535 he was treacherously arrested at Antwerp, and, after a confinement of sixteen months in the Castle of Vilvorde, near Brussels, the State prison of the Low Countries, he was publicly strangled and burned as a heretic Aug. 6, 1536. Tyndale was a man of both learning and talent; his translations were made directly from the Hebrew and Greek, and furnished the basis for the authorized version. His New Testament has been frequently reprinted (in facsimile by Francis Fry, London, 1862); his Pentateuch was edited by Mombert (New York, 1884); and his miscellaneous writings were published by the Parker Society (London, 1848–50). Consult: F. L. Clarke, *Life of William Tyndale* (London, 1883); C. E. Heisch, *William Tyndale* (ib., 1884); R. Demaus, *William Tyndale* (2d ed., ib., 1886); G. B. Smith, *William Tyndale and his Translation of the English Bible* (ib., 1896); I. M. Price, *The Ancestry of our English Bible* (Philadelphia, 1907).

TYNDALL, tĭn'dal, John (1820–93). An English physicist, born at Leighlin Bridge, County Carlow, Ireland. Having only a school education, he found employment at first in one of the subordinate grades of the Ordnance Survey, in Ireland and later in England. After working a few years as a railroad engineer he was appointed teacher of mathematics and surveying at Queenwood College, Stockbridge, in 1847. He then went to Marburg, where he studied for two years, returning to Queenwood in 1851 with the degree of Ph. D. In January, 1853, Tyndall communicated his first paper to the Royal Society, *On Molecular Influences—Transmission of Heat Through Organic Structures*. In the following month a lecture *On the Influence of Material Aggregation upon the Manifestations of Force*, before the Royal Institution, inaugurated his reputation as a brilliant lecturer. In May of the same year he was appointed professor of natural philosophy in the Royal Institution, thus becoming a colleague of Faraday, succeeding as director on the latter's death in 1867. Tyndall early undertook researches on diamagnetism at Marburg in conjunction with Knoblauch, which resulted in a publication entitled *On the Magneto-optic Properties of Crystals and the Relation of Magnetism and Diamagnetism to Molecular Arrangement*. These and later researches were published under the title of *Researches on Diamagnetism and Magno-crystallic Action, Including the Question of Diamagnetic Polarity* (1870). Tyndall spent much time in the Alps, where he combined mountain-climbing with scientific research, making numerous careful observations on the great Swiss glaciers. These were published in popular form and in scientific contributions to the *Philosophical Transactions*. In connection with his study of the glaciers, Tyndall became interested in atmospheric phenomena, particularly the study of vapors. This led to researches on radiant heat and its transmission, radiation, and absorption by vapors and gases. These investigations involved a controversy with Magnus, but Tyndall was able to demonstrate the correctness of his views. These researches were later collected and published under the title *Contributions to Molecular Physics in the Domain of Radiant Heat* (1872). In his study of radiant energy Tyndall analyzed various kinds of light in order to determine the proportion of luminous and nonluminous rays and their effect on various substances. He also discovered that in "optically pure air," that is, air free from dust or other particles, a luminous beam is invisible. These discoveries led to improved methods of sterilization, which are described in his *Essays on Floating Matter of the Air in Relation to Putrefaction and Infection*.

The British government availed itself of Tyndall's scientific ability and in 1866 he succeeded Faraday as a scientific adviser to Trinity House (in charge of the lighthouse service) and the Board of Trade. Tyndall achieved a universal reputation as a lecturer and did much valuable work in the popularizing of science. Few scientific lecturers have been able to present the principles and facts of physics to the general public so successfully as Tyndall. He visited the United States in 1872–73, on a lecture tour that was most successful, and a few years afterward gave the proceeds to forward the cause of original research in the United States. He wrote many popular treatises on scientific subjects, which have been printed in repeated editions and have been translated into foreign languages. Among his works are: *Heat Considered as a Mode of Motion* (1863); *On Sound* (1867); *Faraday as a Discoverer* (1868); *Fragments of Science for Unscientific People* (1871); *The Forms of Water in Clouds and Rivers, Ice and Glaciers* (1872); *Six Lectures on Light Delivered in America in 1872–73* (1873); *New Fragments* (1892 and 1897); *Notes on Light* (1870); *Notes on Electrical Phenomena and Theories* (1870). His works on the glaciers and the Alps include *The Glaciers of the Alps* (1860 and 1896); *Mountaineering in 1861* (1862); and *Hours of Exercise in the Alps* (1871).

TYNDAREUS, tĭn-dă′rē-ŭs (Lat., from Gk. Τυνδάρευς). A King of Sparta. Having been driven out by his half-brother, Hippocoön, he fled to Ætolia and became an ally of Thestius, whose daughter Leda he married. Hercules restored him to Sparta. Leda bore him Castor and Clytemnestra, and at the same time by Zeus became the mother of Pollux and Helen. After the death of Castor and Pollux and their reception among the gods, Tyndareus surrendered the kingship of Sparta to Menelaus.

TYNE, tĭn. A river of north England (Map: England, E 2), formed by the North and the South Tyne in Northumberland Hills. It flows to the east partly on the boundary between Northumberland and Durham, and empties into the North Sea at Tynemouth. One of the principal coal-mining and manufacturing regions of England, and the cities of Newcastle, Gateshead, and South Shields lie on its banks. Length, 80 miles; navigable to Blaydon, about 18 miles. The Tyne ports were second among English ports in the exports of coal in 1912 and fourth in tonnage of vessels arrived and departed. Consult: Guthrie, *The River Tyne* (Newcastle-upon-Tyne, 1880); Palmer, *The Tyne and its Tributaries* (London, 1881).

TYNEMOUTH, tĭn′mŭth *or* tĭn′-. A market town and seaport, the chief watering place of Northumberland, England, at the mouth of the Tyne, 8 miles east of Newcastle (Map: England, E 1). It includes the townships of North Shields, Chirton, Preston, and Cullercoats. Shipbuilding is carried on and there are rope and sail works, besides important fisheries. The sands, about a mile in length, are overlooked by picturesque cliffs. Noteworthy are the gateway of the old castle, the fine ruins of a priory and lady chapel, the master mariner's asylum, the aquarium, and assembly rooms. The municipal borough buildings are in North Shields. Tynemouth was a Saxon fortress. Pop., 1901, 51,514; 1911, 58,822. Consult Adamson, "Tynemouth Priory and Castle," in *Archæologia Æliana*, vol. xxiii (London, 1901).

TYNG, tĭng, Stephen Higginson (1800–85). An American Protestant Episcopal clergyman. He was born at Newburyport, Mass., graduated at Harvard in 1817, and was ordained in 1821. After holding several less important charges, he was rector successively of St. Paul's Church and the Church of the Epiphany, Philadelphia, and of St. George's Church, New York (1845–78). Dr. Tyng was a pronounced evangelical and low churchman and a leading opponent of ritualism. He was widely noted for his fervid eloquence as a preacher, and he zealously advocated total abstinence and other reforms. He published, aside from discourses and memoirs, *Recollections of England* (1847); *Forty Years' Experience in Sunday-Schools* (1860); *The Prayer Book Illustrated by Scriptures* (8 vols., 1863–67); and *The Office and Duty of the Christian Pastor* (1874). He was editor of the *Episcopal Recorder*, the *Theological Repository*, and the *Protestant Churchman*. Consult his *Life* by his son, C. R. Tyng (New York, 1890).

TYPE (Lat. *typus*, from Gk. *τύπος*, type, figure, impress, blow, from *τύπτειν*, *typtein*, to strike). In zoölogy: (1) The name applied by De Blainville to the four branches of Cuvier. These "types" were founded on what were then considered as four fundamental "plans" of organization. (See Classification of Animals.) Cuvier and his successors, notably Von Bael and L. Agassiz, taught that these types existed, as it were, side by side, the Vertebrata the highest, but with no genetic connection, and that each type was characterized by a distinct plan of structure—a view now superseded by that of the doctrine of descent. See Evolution; Phylogeny.

(2) The "type" or "typical species" of a genus is the one first described, or regarded as the most typical, and about which the other species were clustered. A "type specimen" is that individual, or the several individuals, which served as the basis for the description of a new species. The careful preservation of an author's type specimen is all-important in systematic zoölogy and botany, as it is the ultimate source of appeal in unraveling complicated cases of synonymy.

TYPE. In theology, an image or representation of some object which is called the antitype (q.v.). It is applied to Old Testament objects and persons, taken to prefigure ideas in the

Christian history or theology; and earthly things supposed to represent heavenly things. The idea of types appears in Paul and the writer of Hebrews, and came originally from the Greek allegorizing of Homeric tales.

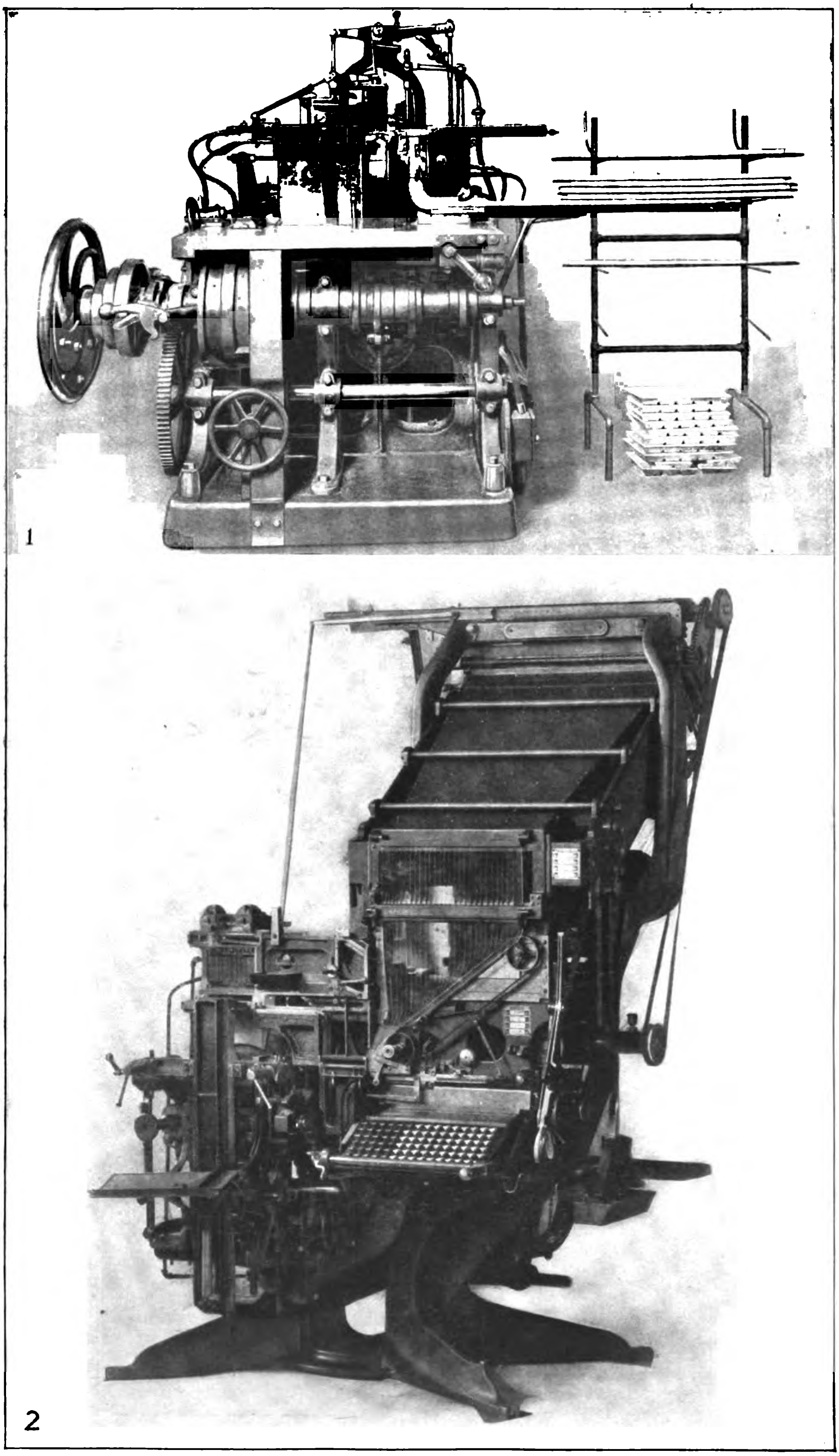
TYPE FOUNDING. The art of founding or casting printers' types. (See PRINTING.) In the early times printers made their own type, but about the middle of the sixteenth century the necessity arose for a division of labor and type founding became a business distinct from printing. The art was first developed in France and from that country spread to Italy, Germany, England, and the United States. The first successful type founder in America appears to have been Christopher Sauer, who established a type foundry in Germantown, Pa., in 1772. In 1796 the Scotch type founders Binny and Ronaldson started a type foundry in Philadelphia, Pa., which after many struggles succeeded. Between 1772 and 1796 several persons, among whom was Benjamin Franklin, attempted to found type, but they all failed to make a business success of their attempts. In 1810 Elihu White established a successful type-founding business in New York, and his successors are still making and selling type although under another firm name. These early type founders all cast their type by hand, after much the same methods, probably, as had been practiced since metal types were first used. Indeed, it was well on towards the middle of the nineteenth century before type was successfully founded by machine to any considerable extent.

Hand Founding. The first step in the process of type founding by hand is the cutting of the counterpunch from the design of the letter, this counterpunch being an engraving in steel of the hollow part of the letter to be made, that is, of the part of that letter which is to appear white where printed. The counterpunch is then impressed to the proper depth in a short bar of soft steel which becomes the punch, or die, with the letter reversed, from which the type is to be made. The outer edges are then cut away until all the lines of the letter are perfect, and then this die is struck into a piece of copper about an inch and a quarter long, one-eighth of an inch deep, and of a width proportionate to the size of the type to be cast. This copper, being so impressed with the representation of the letter, requires to be adjusted to the mold, so that the "face" or impression of the punch (in the copper) may be brought into such relation with the metal which forms the "body" or stalk of the type, that when the types are "set up" they may stand at the proper distance from each other, and be in "line" or range, and also square to the page; this work is termed "justifying," and the copper is now a "matrix." The matrix is now fixed into a small instrument or frame of polished steel, called the mold, which is composed of two parts, with a space between to be filled with the melted metal that forms the type. The space within is of the size of the required body of the letter, and is made exactly true. The melted metal, being poured into this space, sinks down to the bottom in the matrix, and, instantly cooling, the mold is opened, and the type is cast out by the workman. This process of casting types is executed with great celerity. Of course, every separate letter in the alphabet, every figure, point, or mark, must have its own punch and matrix. After being cast the types have to be dressed, and this work is performed by hand. It consists first in removing the projection or jet of superfluous metal that clings to the end which is towards the top of the mold while the type is being cast; second, in rubbing off the burrs, or sharp edges of metal, and smoothing the sides of the types on gritstones; and, finally in cutting a groove in the foot of each type so that each piece may rest securely on its feet, and examining the type with a magnifying glass to discover imperfections. Considering the nature of the operation, type casting by hand is performed, by an expert, with remarkable rapidity, from 3000 to 4000 types per day being produced ready for the finishing process by the experienced workman.

Machine Founding. Various attempts were made during the early part of the nineteenth century to cast types by machinery. The first successful machine for this purpose was devised by David Bruce, Jr., of New York, and was patented in 1838. As subsequently improved, this machine was extensively used in American type foundries and was introduced into Europe. Briefly described, the Bruce type-casting machine consists, first, of a small melting pot, which contains the molten metal, and is placed over a small furnace. In the interior of the pot is arranged a forcing pump and valve for admitting the metal under the piston, and also for preventing the return of the metal into the mass in the pot when the piston is depressed. Every revolution of a crank gives this piston a sudden thrust which injects enough of the melted metal to fill the mold and the matrix. After receiving this metal the mold opens, as a door on its hinges, and at the same instant the matrix springs backward. The type, which is held by a blunt pin, is then hit and released, the mold closes automatically, and the piston injects a new supply of molten metal. A blast of cold air directed upon each mold keeps it cool, so that the machine can do its work rapidly, a rate of one hundred per minute not being uncommon in the smaller sizes. The larger types, however, are more slowly cast as they cool less quickly.

The weakness of the Bruce machine lay in the fact that types produced by it had to be dressed by hand, and although Mr. Bruce in 1868 invented an apparatus for dressing the type mechanically which could be applied to his casting machine, neither it nor the inventions of several men abroad were adopted by type founders generally. Bruce's improved machine was followed by one designed by Henry Barth, of Cincinnati, Ohio, in 1888, which casts the types and finishes them. This machine, which has a much larger output than the earlier ones, retains the general principles of a divided mold which opens to discharge the types, although its construction and processes differ radically from the Bruce machine. In the Barth type caster one-half of the mold is upright and immovable, while the other half slides back and forth at a rapid rate, releasing the types as made and closing again before the next spurt of hot metal is forced in. It breaks off the jet, rubs down the edges, forms the feet, and delivers the types ready for inspection. Type is now produced at the rate of from ten to two hundred per minute, but mention should be made of a rotary type-casting machine developed in England, which

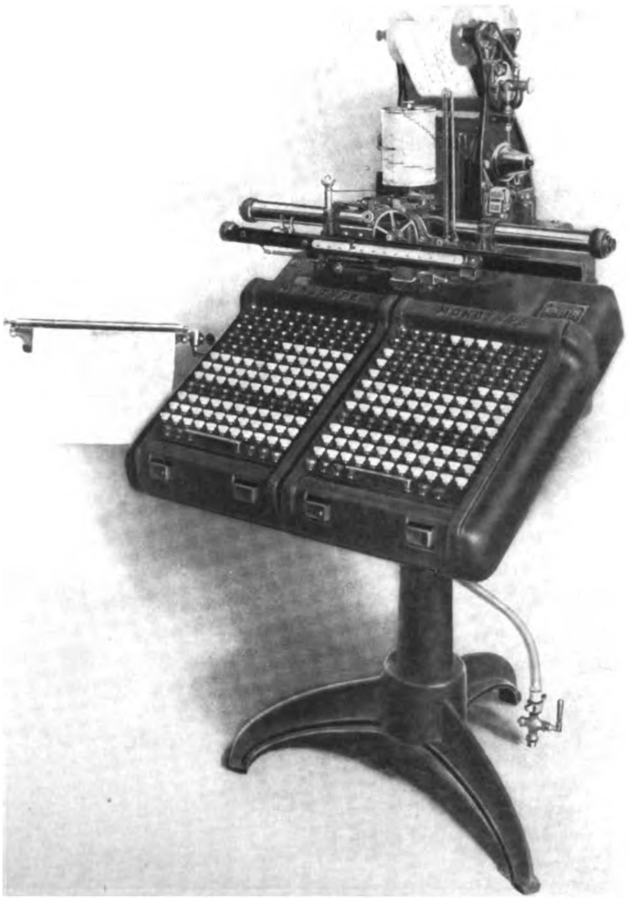
TYPESETTING AND TYPE CASTING MACHINES



TYPESETTING AND TYPE CASTING MACHINES

1. Automatic Type Casting Machine
2. Multiple Linotype Machine

TYPESETTING AND TYPE CASTING MACHINES



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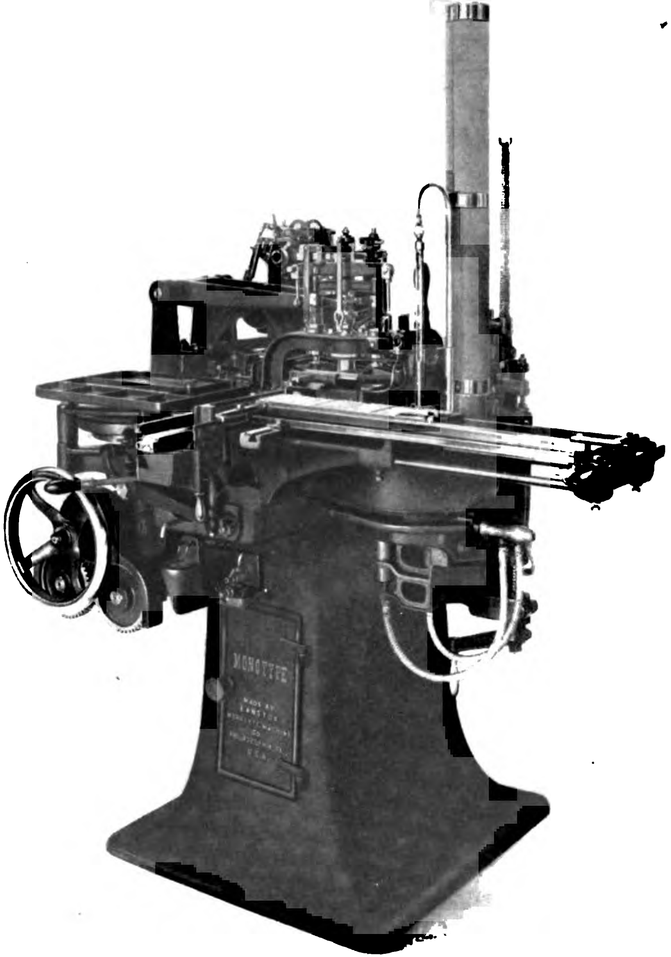


2

MONOTYPE TYPESETTING AND TYPE CASTING MACHINES

1 Keyboard

2. Type Casting Machine

produces type ready for printing without inspection or treatment at the rate of 1000 per minute. In conclusion, mention should also be made of the type punch cutting machine, invented by L. B. Benton, of Milwaukee, Wis., which operates on the principle of the pantograph and produces from one pattern letters of any size desired.

Consult: Reed, *History of the Old English Letter Founders* (London, 1887); T. L. De Vinne, *Historic Printing Types* (New York, 1886); id., *Treatise on the Processes of Typemaking* (ib., 1900). See TYPESETTING MACHINES.

TYPES, THEORY OF. See CHEMISTRY.

TYPESETTING. See PRINTING.

TYPESETTING MACHINES. Machines devised to set or compose printers' types automatically and mechanically. In hand composition the types are picked one at a time from a wooden case and then set one after another in the proper order to form the words which it is desired to print. After the set types have been printed from, or molded to form plates, they are distributed—returned to their proper compartments in the case. (See PRINTING.) Composition and distribution by hand are tedious and expensive, and from early times efforts have been made to devise a machine which would perform these tasks speedily and economically. Until within recent years these attempts were not commercially successful. Perhaps the first serious attempt to design a machine to do away with hand composition was made by Dr. William Church, whose device was patented in England in 1822. His machine was designed to cast types and leave them in reservoirs, and they were set from these reservoirs by pressing keys arranged much like piano keys. After use the types were remelted, the inventor in this way avoiding distribution. Evidently Church was a man ahead of his times, for it was not till 20 years had elapsed that the issuing of patents for typesetting machines began to be frequent. In 1840 James H. Young, of England, completed a machine, which is said to have set types at the rate of 13,000 per hour, but the types had to be arranged in lines, distributed, and, presumably, placed in the magazines by hand, which required three persons besides the operator. The first distributing machine patented in America was invented by Frederick Rosenberg, in 1843, and the first English patent on a distributor was taken out by Etienne Robert Gaudens, in 1840. After this among prominent American inventors follow the names of Mitchell, Alden, Felt, Brown, Westcott, Kastenbein, Paige, Richards, Burr, and in more recent years Thorne, MacMillan, and Mergenthaler. Among the prominent foreign inventors who achieved some success were Hattersley, Mackie, Fraser, and Wicks, in England; Sörensen, of Denmark; Fischer and Von Langen, of Germany; and Delcambre, of France. At present only the Thorne, MacMillan, Mergenthaler, and Lanston machines are much used (the Lanston is a nondistributing machine), but the commercial success reached by some of the earlier machines was remarkable. The Alden machine was at one time used in the New York *Tribune* office. Ten of the Mitchell machines, invented in 1853, are said to have been used at one time in a single office. In 1869 the London *Times* began to use the Kastenbein machines, and set the whole paper by them. In 1880 the Burr machine was tried by the New York *Tribune*, and that paper used three of these machines for some years. In 1884 the Fischer and Von Langen machine was used by the Cologne *Gazette*. All these successes, however, have been far outdone by the Thorne, MacMillan, Mergenthaler, and Lanston machines.

The Thorne machine, a combined setting and distributing machine, which was exhibited in the Paris Exposition of 1878, consists of an upright cylinder with vertical channels around a periphery, each channel holding a column of types—one channel *a*'s, another *b*'s, etc. The lower half of the cylinder is stationary, and its channels contain the distributed types. The upper half of the cylinder turns with a step by step motion, and its channels contain lines of type to be distributed. The motion of the upper cylinder brings its channels opposite those of the lower, when an instant's pause occurs, permitting any type whose projections correspond to the lower channel's nicks to drop. The upper cylinder then revolves one step, bringing the channels again in coincidence. The type is set from the lower channels, the lowest type being pressed out radially when the operator depresses the key which governs it. A rapidly revolving plate below whirls the type around into an endless belt, which carries it to a setting-up mechanism. Here it is turned upright and joins the continuous line of types slowly pushed along towards the justifier, which divides it into lines of column or page measure. A later machine, called the Simplex, closely resembles the Thorne machine. In the MacMillan machine the setting and the distributing are done by separate machines. The magazines of the setting machine are removable, being exchanged for full ones as fast as they become empty. The operator ejects the types from the magazines by pressing suitable keys, and they are set up in long lines to be justified by hand. The distributor consists of a horizontal wheel with radial channels, in which the types to be distributed are placed. The frame surrounding the wheel contains other radial channels having projections corresponding to the nicks in the types. The movable magazines are placed radially in connection with these outer channels. When the wheel slowly revolves, the types pass from the channels of the wheel into the outer channels whenever a type comes opposite one whose projections correspond to its nicks. The Paige machine might be mentioned for its wonderful mechanism, its 18,000 parts composing, justifying, and distributing the types. Its cost of construction and the excessive expense incurred in running it, however, were too great to make it practicable. Both the Thorne and the MacMillan machines set types which are previously made by the regular type-founding process. (See TYPE FOUNDING.) This should be noted before proceeding further, since the Mergenthaler and Lanston machines, instead of composing previously cast types, themselves cast the types as they are desired by the operator.

The Mergenthaler Linotype machine was invented by Ottmar Mergenthaler, and the first machine was completed in 1884. This machine takes its name from the fact that it sets up a line of molds, and casts a line of type (lin'o'-type), or rather a solid metal bar with raised letters on one edge, which is known as a "slug," and is the same as if a line of types were fused solid. The molds or matrices are small pieces of brass, each with a letter impressed on its edge, as shown in Fig. 1. They are placed in magazine tubes, as shown in the illustration, Fig. 2, all the *a*'s in one tube, all the *b*'s in another, and so on, the tubes being arranged vertically in a continuous line. The machine has a keyboard like a typewriter, and the depression of a key, as *D*, connected by a rod, *C*, with the escapement, *B*, causes a matrix to drop into an inclined channel, *E*, down which it falls to the inclined traveling belt, *F*, by which it is carried to the assembler, or stick, *G*, where it takes its place in line. The spaces, *I*, between words are simply duplex wedges, dropped into position from a box, *H*, in the same way as the matrices when the finger key, *J*, is pressed. When the compositor has set all that will go into a line, the duplex wedges are slid one upon another, thus "spacing out" the line, and the line so formed is carried over in front of a slot on the wheel, *K*, where automatically the line of type is cast with metal from the reservoir, *M*, shown in detail in Fig. 3, and its sides and base planed, after which the mold wheel, *K*, makes a quarter of a revolution and the slug is deposited on a galley. The matrices meanwhile are released and passed overhead to the bar, *R*, where thin teeth engage on its horizontal ribs. This bar rises as shown by the dotted line, and the matrices are carried up to the distributor, *T*, whence they find their way to the appropriate magazine tubes, each matrix being released at the proper point. A speed of 4000 ems an hour is the average rate of a good Linotype operator, while those unusually expert attain as high a speed as 5000 to 6000 ems. The advantages of this machine are, among others, that it gives constantly a new type face to print from, and also that there is no distributing to be done, the slugs being remelted after use. The "spacing-out" device is another and a very decided advantage. The Linotype machine in its latest form performs successfully the most intricate kinds of composition, including tabular matter and the use of several classes of characters, and has been perfected to such an extent that the movement of a hand can bring into use a double magazine containing 360 type characters, a triple magazine with 540 characters, or even a quadruple magazine, thus making use of two to four sizes or fonts in one piece of work.

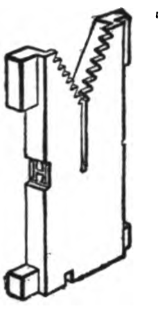


Fig. 1. MATRIX FOR MERGENTHALER MACHINE.

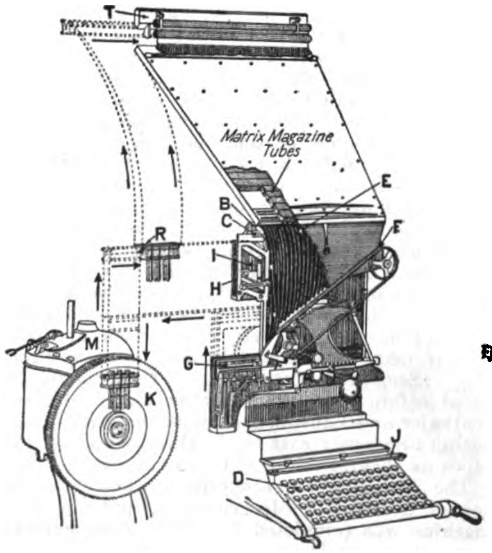


Fig. 2. MERGENTHALER LINOTYPE MACHINE SHOWING ESSENTIAL PARTS.

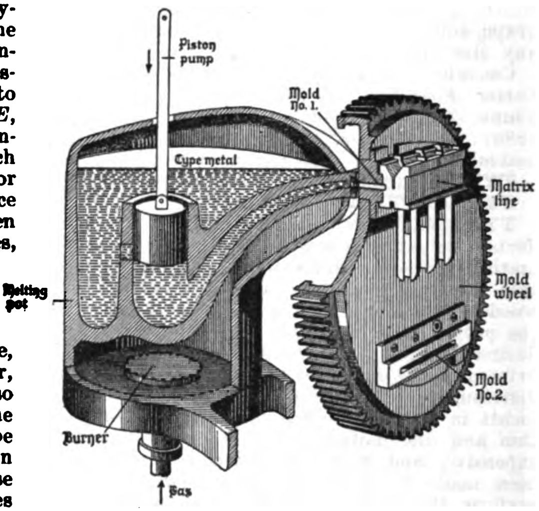


Fig. 3. MELTING POT MOLD WHEEL, ETC., OF LINOTYPE MACHINE.

The Lanston Monotype machine, like the Mergenthaler Linotype, is primarily a type-casting machine, but with the radical distinction that it casts separately each letter, point, and sign, including the spaces. The machine is constructed in two parts, a keyboard and a type-casting machine. The function of the keyboard, which resembles a typewriter and which carries 257 keys corresponding to all of the characters used in a font of type and a few additions representing movements to be performed by the casting machine, is to punch a series of holes in a moving strip or ribbon of paper, which is unwound from one spool to another, passing under a series of punches in its journey, the

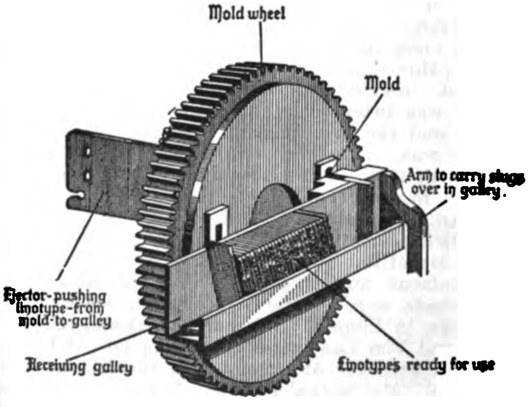

Mold wheel
Mold
Arm to carry slugs over in galley.
Ejector pushing linotype from mold to galley
Receiving galley
Linotypes ready for use

Fig. 4. MOLD WHEEL OF LINOTYPE MACHINE.

motive power being compressed air. These punches are operated by striking the keys on the keyboard. The result of the keyboard operation is, therefore, a narrow roll of perforated paper. This strip, when fed to the casting machine, initiates and controls the movements of the matrix case over the mold. The matrices, which are made of bronze, are carried in a matrix case about three inches square, and any character is brought opposite the casting point by the matrix carrier. After the matrix is in position the sizing of the type is accurately determined by an automatic wedge, the pump mechanism operates, filling the mold and matrix, and a single type is made. The matrix is then lifted from the type which is delivered into the channel blocks where the line is assembled. While this is being done the matrix for the next character is being placed in position over the mold for the next type cast, these operations following one another at the rate of 140 finished types per minute. Justified lines are composed on this machine in sizes from 5 to 18 point, while type for the cases may be cast as high as 36 point, or ornaments, leads, slugs, and rules up to 12 point. Consult T. L. De Vinne, *Modern Methods of Book Composition* (New York, 1904), and J. S. Thompson, *History of Composing Machines* (ib., 1904). See PRINTING.

TYPE'WRI'TERS. Machines for producing legible characters without the aid of movable type.

History. The first typewriter of which we have any record was patented in England in 1714. In 1829 the first American typewriter, called a typographer, was patented by W. A. Burt. About 1833 a typewriter was produced in France, having a separate key lever for each letter. In 1844 and in 1846 typewriting machines were invented in England, which, like many of the early machines, were designed primarily for the use of the blind and so produced embossed characters. Between 1840 and 1860 Sir Charles Wheatstone invented several typewriters which are now in the South Kensington Museum.

Among early American inventors were Charles Thurber and A. E. Beach. The Thurber machine (1843) is simply a set of type bars in a vertical position around a horizontal brass wheel, 16 inches across, which revolves about a central post, the characters being brought into position by hand from either direction. Common types are inserted in the lower ends of the type bars. In 1856 A. E. Beach, who, as early as 1847, had constructed a fairly successful but never perfected typewriter, took out a patent for a machine intended to print embossed letters for the blind. This is worthy of record, because it covered a principle afterward developed into the modern typewriter—viz., a basket of levers arranged in a circle, delivering their impressions on a common centre. In order to make raised letters there were two sets of bars, one coming up and the other down, one having a raised letter and the other its mate, a sunken letter. The strip of paper passed between the two.

Beach was followed by S. W. Francis. To the Beach principle of a circle of type bars Francis added the pianoforte action. Another early inventor was Thomas Hall, who was carrying on independent experiments about the same time as Beach and Francis. Although his machine embodied the principle of a circle of type bars, yet their movement, instead of being from below upward, was from above downward, converging at a common centre, an inked ribbon intervening between type and paper. But Hall was compelled to abandon his efforts without realizing his expectations, and only a few of his typewriters were made. In 1881 he took out a patent on a typewriter made on an entirely different plan. It had a perforated dial plate, two inches square, containing seventy-five characters. Underneath this dial plate in his latest machine, called the Century, patented in 1889, was a rubber-faced cylinder with letters on its surface corresponding to those on the dial plate. When the stylus is brought to any perforation in this dial plate, the cylinder beneath is turned to present the corresponding letter to the paper, and the stylus being pressed into the hole the letter is printed. The under cylinder revolves against an inked pad.

About 1867 Charles Latham Sholes, Samuel W. Soule, and Carlos Glidden, of Milwaukee, Wis., began to experiment on the construction of a typewriter, and from this the Remington typewriter had its origin. The first crude model was completed early in 1868. Soule dropped out of the enterprise almost immediately and Glidden finally disposed of his interest also. Sholes, encouraged by suggestions and financial aid from James Densmore, of Meadville, Pa., who early purchased an interest in the machine, continued his experiments. Several models were built and were tested under conditions of service by practical stenographers, until in 1873 the inventors considered the machine sufficiently perfected to warrant manufacture upon a large scale. A successful effort was made to interest the gun manufacturers, E. Remington & Son, of Ilion, N. Y., in the manufacture of the machine. After more than a year of patient work by the skilled mechanics at Ilion, a complete remodeling of the crude device of the inventors resulted. The first model was put upon the market in 1874. It retained only the principles of the original construction. As many of its elements are fundamental, it may be briefly described as follows: Pivoted about a horizontal ring were type bars, some 38 in number, with steel types inserted in their lower ends, and so arranged as to rise vertically to a common centre. The short arms of these levers were connected by wire rods with the levers proceeding from the keyboard. The paper to be printed passed around a rubber cylinder, and the lower side of this cylinder received the impact of the types. An inked ribbon intervened between type and the paper. This ribbon, in the operation of the machine, was gradually unwound from a spool at one side of the machine to another on the other side, and when the spool was exhausted the motion was reversed. With each release of a key by the finger of the operator, a ratchet movement at the back of the cylinder allowed the carriage to move along one space, thus making room for the next letter. The tension was kept on the carriage by a coiled spring and strap. At the end of a line the carriage was drawn back to the starting point by means of an arm depending in front, and the same movement turned the cylinder, and carried the paper to make ready for the following line.

In 1877 an improvement was introduced, whereby each type bar in the circle was made to carry two characters, adjusted to separate common centres. By depressing a shift key the carriage is thrown backward to the second centre, which is adjusted to receive all the capital letters and many other characters placed in relation thereto.

In 1894 an improved model, having a lighter and stronger paper carriage, was placed upon the market. The shifting movement was accomplished by a new mechanism, and improvements in the spacing mechanism, greatly increasing the speed of the machine, thus making it more acceptable to expert operators, were adopted. An automatic ribbon reverse was later included, and, in addition to increasing the number of characters and the width of the carriage for holding wide sheets of paper, many minor points of improvement have been from time to time adopted by the manufacturers.

The Remington was the pioneer machine, and its first competitor was the Caligraph, promoted by George W. N. Yost. The Caligraph had the basket of type bars, but had a polygonal impression cylinder, the impressions being received on the flat faces. It resembled the Remington, but had a double set of keys, thus obviating the use of a shift from capital to small letters, and the horizontal keys were hinged at the front. This machine was for a time the most important of those machines where there was a separate key for each type character, but its manufacture was discontinued. Mr. Yost left the Caligraph and brought out the Yost typewriter, which does not use the inked ribbon, but its type, when at rest, bears against a circular inking pad.

Unlike the foregoing was the Hammond machine, invented by James B. Hammond in 1880–83. Its central principle was the type wheel, a favorite device of John Pratt, who labored long, but unsuccessfully, to make his invention a success. The arrangement of the original keyboard of the Hammond differed materially from that of the Remington, being almost semicircular. In 1890 a new model, the Universal Hammond, was introduced, having a keyboard with three banks of keys, like other standard machines. Still later, a light rubber shell or shuttle, supported by a metal backing, was substituted for the wheel. In this machine 90 types are cast in true alignment upon a curved plate of vulcanite, called the "shuttle," in the form of an arc of a circle. The backing for the shuttle is a heavy cast-iron ring called "anvil," and may be compared to a wheel having a slot in the centre of its face in which the steel web of the shuttle slides. This forms a guide for the shuttle in its horizontal movements. The anvil is stationary and firmly fixed to a vertical shaft by which it may be raised to bring either of three rows of type into the printing position. The depression of a key controlling the character to be printed brings that character on the shuttle into position by means of a shuttle arm and a series of index pins, each one of which corresponds to the angular distance of any character from the normal position. The impression of the hammer is at that moment received by means of a lever, which releases the hammer spring and the carriage and forces the paper against the type on the face of the shuttle. As these shuttles are interchangeable, it is possible for the one machine to produce any number of different alphabets or styles of type.

The Smith-Premier was placed on the market in 1889. This, like the Remington, is a type-bar machine, but has a large keyboard with a key for each character as in the Caligraph. A novel feature of this machine is a round brush which can be revolved to clean the type. Another improvement of the Smith-Premier was a three-colored ribbon so arranged that a change from one color to either of the others can be made by simply pushing a lever.

In 1892 the Blickensderfer machine, having a type wheel which rotated so as to bring the appropriate characters in position to strike the paper, was introduced, and attained great popularity on account of its simplicity and low cost. Its makers later developed an electric typewriter where an electric motor supplied the power and rendered the manipulation much easier for the operator, and eventually took up also the making of type-bar machines of the conventional type.

During the closing decade of the nineteenth century, by which time the use of the typewriter had become almost universal, many new machines were brought upon the market, so that at its close there were over 100 different machines, on which nearly 1700 patents have been granted. Various new models were developed, most of which were along conventional and established lines. With few exceptions cheap typewriters have never proved durable and successful, though latterly several small and portable machines have been placed on the market. The demand for such machines undoubtedly exists, particularly for school and domestic use in addition to traveling.

Perhaps the most noted of the successful machines brought out at the later stage was the Underwood typewriter, first put on the market in 1896, but which soon came into widespread use. This is a type-bar machine, but instead of the usual upright basket, making a practically complete circle of type bars, the letters are contained in a segment of a circle, and this partial basket is laid upon its side and moves as a whole when the shift key is operated. The advantage of this arrangement is that the type strikes on the front of the impression cylinder, instead of on the bottom, thus keeping the work entirely in sight. As early as 1891 visible writing had been produced on the Williams, using an inked pad, and about the same time in the Brooks, a ribbon machine. The same advantage was also secured in the L. C. Smith machine, where ball bearings were employed to secure easy running and light touch. This machine also enjoyed wide popularity, while the demand for visible writing led to a remodeling of the Remington to secure that end, and the Monarch machine carried out the idea of the shifting segment. In the Oliver machine there is a double instead of a single shift key for which advantages are claimed.

An important development in typewriters was a machine which served for writing letters, writing on flat cards, on the page of a bound book, writing bills, tabulating, and adding one or more columns of figures as they are written by the machine. The Elliott-Fisher billing and adding machine, patented May 15, 1906, one of the first of these machines, was a development of the Elliott & Hatch book typewriter. In this machine the sheet which was being written was held stationary on a flat platen, while the machine proper, consisting of frame, type levers, etc., moved either forward and backward or sideways. Later came modifications of ordinary typewriters whereby tabulating and adding mechanism were supplied so that not only billing but all commercial bookkeeping could be done on the machine used for ordinary correspondence. The Remington adding and subtracting typewriter was brought out in 1907, and in 1915 a most elaborate machine was perfected. The Underwood Company and other makers also brought out bookkeeping and adding typewriters, each of which possesses certain advantages and conveniences. In fact these machines have completely revolutionized bookkeeping and accounting, for they are able to list the items and to add, subtract, or cross add.

Manifolding. Reprints may be secured by the ordinary copy press, copying ink being used on the typewriter ribbon or pad. By the use of carbon paper alternately between thin sheets of ordinary paper, the typewriter itself can be made to produce several copies at a time. Thus in modern business operation as referred to above by the use of loose leaf books of account, the original order, the invoice, the bill for goods, and the posting in the ledger can be effected at one operation, or other modifications of the system made. By the use of a special kind of paper on a sheet of cloth, stencils may be made for the mimeograph. See COPYING MACHINE.

The rapid growth of the use of the typewriter to a point where it has become indispensable in all lines of business and many other forms of activity, is noteworthy. It was placed on the market about 1875 and its usefulness was soon appreciated by courts of law, business houses, and governmental departments. In the early eighties its use became general in all departments of the United States government except the Department of State. It was first employed for instructions to diplomatic and consular officers in 1895 and the official communications of the department to diplomatic officers of foreign countries were first executed upon the typewriter in 1897. Now it is even customary for armies in the field to have typewriters as part of the headquarters equipment for issuing orders and reports. That the typewriter is found everywhere in business to the practical exclusion of handwriting has long been evident, for the gain in time for transcribing and for reading correspondence and records was early appreciated. An average operator can write on the machine some 60 words a minute or at a rate about three times as fast as that of the average penman, while in competition experts maintain a speed well in excess of 100 words a minute. Furthermore, the addition of various mechanical adjuncts for spacing, addressing, tabulating, etc., reduces to a minimum the time and facilitates the entire operation. The use of ribbons of more than one color, readily interchangeable, now a feature of most machines, adds to the effectiveness of the printing, giving emphasis as desired.

Once the services of a stenographer were required for correspondence, but now by the use of phonographs or dictating machines any qualified typist with sound tubes at her ears is able to transcribe letters or other spoken communications when the sound is reproduced. In most newspaper offices reporters and other writers are required to prepare their manuscript on typewriters. Aside from its mechanical considerations the typewriter must be considered as an important element in the social revolution caused by the entrance of women into commercial life. It was found that the light labor involved in copying and transcribing notes could be performed readily by women of fair education and general aptitude as well if not better than by men and, once their success was established, women's position in business life was assured, so that, in the census year 1910, of the 593,224 women engaged in clerical operations 263,315 were stenographers and typewriters, as compared with 53,378 males.

Typewriters are now an essential part of the equipment of telegraph and cable offices, for so rapidly can messages be transcribed that the receiving operator can not only keep pace with the sender, but can maintain speed so great as to bring about the abbreviation of the telegraph code. In the modern use of the typewriter the so-called touch system is extensively practiced. There the typist is taught to locate the positions of the various keys so that she can strike them at will without looking at the designation of the characters. In this way increased speed and comfort to the operator are secured and even a blind person may use a typewriter. It may be remarked that in all makes of typewriters the arrangement of keys is the same, the so-called universal keyboard being employed with but few and slight modifications. This is arranged so that the letters most used come in the centre and in convenient proximity.

Attention had been directed to the production of power typewriters, in which the operator has merely to touch a key with sufficient force to release latent mechanism, whereupon power from some external source completes the impression. In electrical typewriters, of which several have been patented, the impression mechanism is operated by magnets, the operator closing the circuit when he touches the key, but these never have been widely used.

Statistics. According to the thirteenth United States census (1910) there were in 1909 in the United States 89 factories devoted to the manufacture of typewriters and supplies, in which a combined capital of $26,308,688 was invested. These factories produced in 1909 typewriters and supplies valued at $19,718,767. Of the total product $6,899,069 worth, or over one-third of the total number, were exported, and this figure had grown to $11,532,364 in 1913, declining to $5,315,134 in 1915. The enormous growth of the industry is shown by the fact that in 1889 there were only 30 factories, having a capital of $1,421,783, and producing an output valued at $3,630,126.

TY'PHA (Neo-Lat., from Gk. τύφη, *typhē*, cat-tail). A genus of widely distributed marsh plants of the family Typhaceæ. Two species are American, *Typha latifolia* and *Typha angustifolia*, and are popularly known as cat-tail or reed mace. The former, which is the commoner, is sometimes called bulrush. It grows to the height of 5 or 6 feet. The astringent rootstocks are rich in starch, and the young shoots of both species are much eaten by the Cossacks of the Don, and are sometimes used in England under the name of Cossack asparagus. The pollen of Typha is inflammable, like that of Lycopodium, for which it is used as a substitute. *Typha angustifolia* and *Typha elephantina* are employed in India and Europe for making mats and baskets, chair bottoms, etc. The leaves of Typha are commonly used in the United States in cooperage to place between the staves and in the seams of barrel heads. See Plate of AQUATIC PLANTS.

CAT-TAIL (*Typha latifolia*).

TYPHLOP'IDÆ. See BLINDWORM (2).

TYPHO'EUS. See GÆA.

TY'PHOID EXTRACT. See ORGANOTHERAPY.

TYPHOID FEVER (from Gk. *τυφώδης*, *typhōdēs*, delirious, from *τῦφος*, *typhos*, stupor, mist, vapor, smoke, from *τύφειν*, *typhein*, to smoke; connected with Skt. *dhūpa*, smoke), or ENTERIC FEVER, TYPHUS ABDOMINALIS, ABDOMINAL TYPHUS. A specific disease, infectious chiefly or entirely through the excretions, having a febrile period of about three weeks, and characterized by ulceration of the intestinal lymph follicles, swelling of spleen and mesenteric glands, and parenchymatous changes in many organs.

Typhoid fever is due to a specific microörganism known as the typhoid bacillus, a small bacillus with rounded ends, about two micromillimeters in length and about one-third as broad. It is motile and grows at room temperature on the ordinary culture media, preferably in the presence of air or oxygen, but capable of life without. (See Plate of DISEASE GERMS.) During an attack of typhoid fever the bacillus is found regularly in the intestinal and mesenteric lymph nodes and as a rule in the spleen. In the early stage of the disease, when the nodes are simply enlarged, few or no bacilli are present in the bowel evacuations. Later, when ulceration of the nodules has occurred, the bacilli are usually found in the stools. In urine and bile it is quite common to find the typhoid bacillus, and in these secretions they may persist long after recovery, thus furnishing possible sources of infection long after the danger is supposed to have passed. Typhoid bacilli have also been reported in the blood, lungs, pleura, liver, kidney, uterus, and in other organs in which typhoid lesions occur; also in typhoid serous exudates and in the heart in typhoid endocarditis.

Contraction of typhoid fever is caused by taking the bacilli into the mouth and thence into the intestine. Food and drink are usually the vehicles which serve for the entrance of the bacillus, water and milk being probably the most frequent sources of infection. The latter is especially dangerous from the fact that the typhoid bacillus not only lives but multiplies in it. Water and milk, however, are only dangerous when they actually contain the typhoid bacilli which have entered into them from the excretions of typhoid patients or carriers.

The typhoid carrier is a person who harbors and excretes the bacilli in large numbers, although in normal health and generally unaware of his infection. Cooks and dairymen are most dangerous in this respect to the community and to them have been traced many scattered epidemics. Flies having access to the excreta of typhoid patients are capable of contaminating food and spreading the disease. Other minor sources of infection are fresh vegetables and oysters.

The initial seat of activity of the typhoid bacillus is undoubtedly in the intestines. Here the bacillus first sets up a catarrhal inflammation of the mucous membrane. This is followed by the characteristic lesion of typhoid, viz., inflammation of the intestinal lymph nodes. Both solitary nodules and Peyer's patches are affected, although it is in the latter that the changes are usually most marked. These nodules may undergo resolution, or may break down, forming the typical typhoid ulcer, which may erode blood vessels, thus setting up hemorrhage; or perforate into the peritoneal cavity, giving rise to peritonitis. Ulcers are formed in Peyer's patches, gradually increasing in size, and discharging into the intestines. Changes in the liver and spleen are of common occurrence in typhoid fever. Of the two the spleen is most frequently affected. The changes consist of congestion with proliferation of the cellular elements of the spleen and consequent increase in the size of the organ.

Typhoid fever is widely distributed throughout the world, but is especially prevalent in the temperate zones. From its prevalence during the autumn it has been called autumnal fever. Young adults are usually attacked, the affection being comparatively rare among children and old persons. Hot and dry weather are favorable for its development. Its distribution is largely due to a contaminated water supply. Cities which drain their sewage into the rivers or lakes whence they derive their drinking water suffer most severely. In 1914 to 1915, the death rate in several large cities of the United States per 100,000 population was: New York, 6.2; Detroit, 13; Baltimore, 22.4; Birmingham, Ala., 40.2; Nashville, Tenn., 47.3.

The incubation period of enteric fever lasts from 8 to 14 days, or longer. The onset is gradual and is followed by nausea, loss of appetite, headache, pains in the back and extremities, nosebleed, and perhaps a distinct chill. For a few days the patient may go about his work, but at the end of that time is compelled to go to bed. This may be reckoned the definite onset of the disease. The fever is characteristic. During the first week the temperature rises steadily by a degree or a degree and a half a day until 103° to 105° F. is reached; during the second week the fever remains high; during the third week, in cases of moderate severity, it gradually declines, and in the fourth week convalescence begins. About the seventh to the tenth day the patient presents the typical appearance of enteric fever. He is dull, listless, and apathetic, the eyes are bright, the pupils dilated, the face pale, with flushed cheeks and dark lips. The tongue is dry and red, with a band of white fur on each side. At the end of the first week a rose-pink rash appears on the abdomen. It consists of from 10 to 30 raised circular spots, which fade on pressure. These spots last only two or three days, but successive crops appear. The abdomen is distended and tender, and several offensive yellow stools may be passed daily. Death may occur at the end of the second week, from hemorrhage or perforation of the bowel. The third week is marked by great weakness, muscular tremors, delirium, and failing heart, although the fever is slowly dropping, and death may take place from exhaustion. Convalescence in the average case sets in during the fourth week. In a certain number of cases relapses occur; these are, as a rule, shorter and milder than the original attack, but are similar in character. One attack of enteric fever confers immunity from others. The mortality ranges from 10 to 30 per cent.

To prevent the spread of typhoid the following precautions are observed. The stools and urine of patients are thoroughly disinfected by immersion in strong solutions of corrosive sublimate, carbolic acid, or chlorinated lime and protected from flies. In districts having a defective drainage system the dejecta may finally be disposed of by mixing with sawdust and burning or burying in trenches after saturation with chloride of lime. Bedpans, rectal thermometers, syringes, tubes, and all other utensils coming in contact with the patient's discharges are disinfected by boiling and immersion in antiseptic solutions. Bedclothes and linen are similarly disinfected. During epidemics drinking water and milk should be boiled and raw vegetables such as lettuce and celery avoided.

Careful nursing and regulated diet are of first importance in the treatment. The patient is strictly confined to bed from the beginning of the disease until the temperature has been normal for at least a week. A liquid or semisolid diet has been found best throughout the course of the attack. The modern tendency is to feed the patient more liberally than in the past. Broths, consommé, albumin water, and beef juice are given to vary the diet. Milk should be peptonized or mixed with lime water or vichy. The patient is urged to take plenty of cool water, and the juice of an orange or lemon may be given at intervals. Food is taken about every three hours during the day, and once or twice at night if there is great exhaustion.

Control of the fever is the most important element in the direct treatment of typhoid, and this is best accomplished by means of cold water, by sponging, the wet pack, and bathing. Sponging is sufficient in ordinary cases and for children and delicate persons. The cold pack consists in wrapping the patient in a sheet wrung out of water at 60° or 65° F. The full bath, or cold tubbing, was introduced by Brand of Germany, and this treatment was formerly almost universally followed in hospitals. Of late years, however, it has lost favor on account of its severity.

The drug treatment of typhoid is symptomatic. Cold sponging renders febrifuges unnecessary. Antipyrine and phenacetin are sometimes given, but they tend to depress the heart. Intestinal antiseptics, such as turpentine, salol, and carbolic acid, render the stools less offensive and prevent the production of gas. Return to solid food must be gradual on account of the danger of perforation through intestinal ulcers.

Widal's Test for Typhoid Fever. This is a reliable method of diagnosis, and depends upon the fact that the blood of typhoid-fever patients acquires the property of causing a reaction when brought into contact with active typhoid bacilli. In the test a small amount of blood or serum diluted is mixed with a fresh pure culture of the typhoid bacillus. The reaction, as observed under the microscope, consists in a destruction of the motility of the bacilli and their agglutination, that is, their collection into larger or smaller clumps. The reaction may not occur in the first stages of the disease. A positive result with quite dilute serum makes the diagnosis of typhoid almost certain, although the reaction does rarely occur in other diseases.

Paratyphoid fever is an infectious disease, clinically resembling typhoid, but milder and more irregular in its course. It is due to a specific bacillus or bacilli which occupy a position intermediate between the Bacillus typhosus and the Bacillus coli. It is sometimes called the paracolon bacillus. Diagnosis is based on the agglutination test, the Widal reaction being negative.

Immunization against typhoid fever is conferred by the injection of a specific vaccine. Protection is fairly certain and immunity lasts, according to the latest available data, for two and a half years or more. Vaccination is practiced in all the armies of the civilized world, and the typhoid rate has been reduced at least 75 per cent by these measures. The value of typhoid vaccination is illustrated by the statistics of the first year of the European War. From the beginning of hostilities only 1365 cases of typhoid occurred among the British troops in France and Belgium, whereas in the Boer War over 20,000 cases occurred in a very much smaller number of troops. See HYGIENE, *Military Hygiene.*

Consult: William Osler, *Studies in Typhoid Fevers* (Baltimore, 1895); id., *Problems of Typhoid Fever in the United States* (ib., 1899); J. M. Anders, *A Textbook of the Practice of Medicine* (12th ed., Philadelphia, 1915); G. A. Hare, *A Textbook of the Practice of Medicine* (3d ed., ib., 1915); *Reference Handbook of the Medical Sciences* (3d ed., New York, 1915); G. C. Whipple, *Typhoid Fever: Its Causation, Transmission, and Prevention* (New York, 1908); J. W. Schereschewsky, "Anti-typhoid Vaccination," in United States Public Health and Marine Hospital Service, *Public Health Report, No. 56* (Washington, 1911), and numerous other publications of this bureau. See INFLUENZA IN ANIMALS.

TYPHOID FLY. See HOUSE FLY.

TY′PHON (Lat., from Gk. Τυφών), or TYPHOËUS. In Greek legend, the offspring of Gæa, or Earth, and Tartarus. He was a fire-breathing monster with 100 serpent heads, who after the overthrow of the Titans (q.v.) strove to wrest the power from Zeus. He was finally smitten by the thunderbolt and cast into Tartarus. By Echidna he was the father of many monsters who were destroyed by Hercules. Typhon seems to be the personification of the volcanic elements, and the scene of the conflict is at first in the volcanic regions of Lydia and Phrygia, and later about Ætna and Stromboli, while the description in Hesiod of the battle with Zeus is a vivid picture of a violent eruption. For the Egyptian Set-Typhon, who later influenced the Greek story, see SET.

TYPHOON′ (Portug. *tufão*, from Ar. Pers. *tūfān*, tempest, hurricane, from *tūfānidan*, to roar, cry out; cf. Gk. Τυφῶν, *Typhōn*, Typhon (q.v.); also Chin. *t'ai fung*, great wind, Formosan Chin. *tai fŭng*, typhoon). The name applied to the hurricanes that visit the waters east of Asia. From a meteorological point of view the typhoon is a special case of the cyclonic storm. Typhoons usually originate at about or east of the longitude of Guam and nearer the equator than Manila; they move towards the west or west-northwest, but gradually curve so that they often pass northward or northeastward along the coasts of China and Japan. Typhoons appear to be quite as severe on the average as the West Indian hurricanes; the barometer often falls lower at the centre, and the rainfall is probably heavier. Knowledge of the laws of typhoons is now sufficient to justify cautious predictions of their paths and the issuance of storm warnings to navigators. All the baguios and typhoons of the North Pacific Ocean have been classified as follows by Doberck, Algué, and Bergholz:

Group 1 occur between December and March; the storms originate between 5° N. and 12° N. and 145° E. and 143° E.; move at first towards the north-northwest; reach the vertices of their parabolic orbits in latitude 15° N.–19° N. and then turn towards the north-northeast.

Group 2 occur in April and May or October and November; originate between 129° E. and 147° E. and 5° N. and 12° N.; move towards the northwest; have their vertices in latitude 16° N.–21° N., and then move towards the northeast.

Group 3 occur between June and September; originate between 139° E. and 126° E. and 20° N. and 8° N.; move at first towards the northwest by north; have their vertices at 21° N.–25° N. and then turn to the northeast by east.

When typhoons reach the China Sea in the months of December to March they generally continue towards the east-northeast, and are lost in the interior of the country. Those that occur in the summer and spring months recurve much more frequently, attain higher latitudes, and are frequently destructive in Japan and adjacent waters; occasionally they continue moving northeastward until they reach Bering Sea or the Aleutian Islands.

Full details of typhoons are published regularly by the meteorological offices of Hongkong, Tokyo, and Manila, and their general tracks, together with occasional special studies, are published on the Pilot Charts of the Pacific Ocean, published monthly by the United States Hydrographic Office. Consult José Algué, *The Cyclones of the Far East* (2d ed., Manila, 1904), and W. Doberck, *Law of Storms in the Eastern Seas* (4th ed., Hongkong, 1898).

TY′PHUS FEVER (Neo-Lat., from Gk. τῦφος, stupor, mist, vapor, smoke), JAIL FEVER, SHIP FEVER, or SPOTTED FEVER, TYPHUS EXANTHEMATOUS. An acute, specific, and highly contagious fever, endemic, and also prevailing in epidemics, especially in times of destitution and in the presence of overcrowding and bad ventilation. It is due to the presence of a bacillus discovered by Dr. Harry Plotz (q.v.) in 1915, the Bacillus typhi exanthematici, and is attended with no characteristic lesions of the tissues as in the case of typhoid fever, but with serious blood changes. The disease is carried by the body louse (*Pediculus vestimenti*) principally, but the head louse (*Pediculus capitis*) is also capable of transmitting it. It is ushered in by an abrupt onset, with marked nervous symptoms, rheumatic pains, rigors, and headache. A maculated eruption appears, most commonly on the fifth day of the disease, of slightly elevated spots, disappearing on pressure at first, afterward persistent and darker, and there is early prostration of the nervous and muscular systems. Delirium usually comes on during the second week. The fever terminates by a crisis, which occurs on or about the fourteenth day, after which recovery is very rapid.

In former centuries typhus fever was a common scourge, in times of war and famine, under the names of jail fever, camp fever, ship fever, and the like. The earliest accounts of the disease described epidemics in the sixteenth century in France, Italy, and Hungary; and the earliest description is credited to Fra Castorius of Verona (1580), in his work *De Contagione et Contagiosis Morbis*. The name typhus was specifically used by de Sauvage in 1760. Severe epidemics occurred in Europe during the seventeenth and eighteenth centuries. Willis (1686) in England gave it the name "Synochus putrida." The mortality was appalling and special hospitals were built for typhus patients. It is a disease of the temperate and cold zones and is due directly to overcrowding of people in uncleanly surroundings thus favoring communication through lice. At the present time the disease is limited to half-civilized countries and to the slums of seaport cities. Local outbreaks sometimes occur on ships, and in jails and poorhouses. The mortality in different epidemics varies from 12 to 20 per cent. It was for a long time confounded with typhoid fever (q.v.), but it differs from this in many ways.

During the epidemic of typhus which spread over Serbia in 1914–15, it is stated that every hospital, prison camp, barracks, and almost every home was invaded; and a conservative estimate puts the mortality at 135,000, including 30,000 Austrian prisoners. The first cases of the disease reached the port of New York between January 7 and May 2, by means of passenger steamers sailing mainly from Mediterranean ports. This was the first typhus visitation in 20 years and the cases in quarantine furnished material for Plotz's studies and established the identity of true typhus with the milder endemic form, which had been known as Brill's disease. Plotz made a vaccine which was used in Serbia and was thought to have some value, at least in prophylaxis. In 1913 Nicolle induced the disease in a chimpanzee by injecting the blood of typhus patients; and succeeded in transmitting the disease from monkey to monkeys, by means of the body louse. The latter observation has been confirmed by Anderson, Goldberger, Ricketts, and others. Ricketts lost his life by contracting the fever in Mexico, where it is very prevalent and is known as tabardillo.

The treatment of typhus is symptomatic. As the disease is exceedingly contagious, patients are promptly isolated, placed in clean surroundings, and their clothes disinfected or sterilized by heat to destroy lice and their eggs. The high temperature is reduced by means of cold sponging, the cold pack, or bathing, and by the administration of quinine, antifebrine, or phenacetin. All patients are benefited by small doses of the mineral acids, and mild saline laxatives. For the headache and delirium cold applications to the head are indicated. Alcohol is used as a stimulant throughout the attack, to combat the great prostration. During convalescence such tonics as strychnine and quinine are most useful. The patient may be nourished by liquid foods. Consult V. C. Vaughan, "History and Epidemiology of Typhus Fever," in *Journal of the American Medical Association* (Chicago, May 29, 1915).

TYPICAL PHRASE (Lat. *typicalis*, from *typicus*, from Gk. *τυπικός*, *typikos*, relating to a type). In dramatic music, the recurrence of a theme or phrase to mark the similarity of the dramatic situation between the part where such a phrase occurs and the part where it was first heard. The typical phrase is essentially different from the leitmotiv. Whereas the leitmotiv constitutes the basic material and is employed in the same manner as a theme in a symphony, the typical phrase is only a quotation, and can do nothing more than recall a similar situation. See LEITMOTIV.

TY'POGRAPH'ICAL UNION OF NORTH AMERICA, THE INTERNATIONAL. The labor organization of the printers and those engaged in kindred trades, the oldest national trade union in the United States. It was organized in 1850 as the National Convention of Journeymen Printers, but assumed the name National Typographical Union in 1852, and the present name in 1869.

In organization the International Typographical Union is a typical industrial union. Provision is made for the separation of the different trades into trade district unions, which retain a large measure of autonomy, although they combine for purposes of defense, in each jurisdiction where there are unions of more than one trade, in allied printing trades councils. The International itself, however, strictly regulates the maximum hours of labor of all members, the number of days' work per week, the method of securing work and the discharge of employees (through foremen, who must belong to the union), the employment of substitutes, type standards in the fixation of piece scales, the use of sublists (lists of authorized substitute workers), and the interchange between newspapers, not owned by the same company, of matter previously used either in the form of type, matrices, or photo-engraved plates. Of the receipts from regular dues, five cents is apportioned to the general fund, five cents to the special defense fund, seven and one-half cents to the defense fund, seven and one-half cents to the burial fund, fifteen cents to the endowment fund of the Union Printers' Home, at Colorado Springs, Colo. In addition to the per capita tax, every member pays five cents per month as a subscription to the official paper, *The Typographical Journal*, published monthly at Indianapolis.

TYPOG'RAPHY. See PRINTING.

TYR, tīr (Icel. *Týr*, AS. *Tīw*, OHG. *Zio*; connected with Lat. *Ju-piter*, Gk. *Ζεύς*, *Zeus*, the chief god, Skt. *dyāuṣ*, sky). The old Norse name of a Teutonic deity. It is possible that in the early common Germanic system Tyr was the foremost god, whose place was later taken by Odin. In the Eddas he is represented as the son of Odin, the god of war and fame. When the Æsir (q.v.) persuaded the wolf Fenrir (q.v.) to allow himself to be bound with the cord Gleipnir, Tyr put his right hand in the wolf's mouth, as a pledge that he would be loosened, and when the gods refused to release Fenrir the wolf bit the hand off at the wrist. At the twilight of the gods he will meet his death at the same time with his enemy the monster dog Garm. See RAGNARÖK; SCANDINAVIAN AND TEUTONIC MYTHOLOGY.

TYRANNOSAURUS. An extinct tyrant lizard which, when erect, stood 18 feet high. It was one of the most formidable of all the huge dinosaurs whose remains are found in the Cretaceous rocks of the western United States. Consult F. A. Lucas, *Animals of the Past* (New York, 1913).

TYRANT (Lat. *tyrannus*, from Gk. *τύραννος*, master, sovereign). A name given in modern times to an arbitrary and oppressive ruler, but by the ancient Greeks applied not necessarily to one that exercised power badly, but merely to one that obtained it illegally, or to one who held sovereignty originally established by usurpation. While tyrants appear sporadically at all periods in Greek history, they were especially numerous during the seventh and sixth centuries B.C., when it was not difficult for an ambitious and unscrupulous man, often a noble, to appear as a leader of the populace and by its aid secure power. Often a violent seizure of the power was welcomed as affording relief from present evils. In other cases the tyrant of the nobles was a lawgiver to the demos. These early tyrants seem usually to have ruled generously towards the poorer classes, but towards other nobles they were naturally suspicious and frequently stern and cruel. While there are cases in which ancient testimony declares the tyrant a true tyrant in the modern sense, the greater number of these men seem to have aimed at a just rule, and the glory and prosperity of their states; they were frequently the patrons of literature and the fine arts. This is especially noticeable in the Sicilian tyrants of the fifth century B.C. After the Persian wars, the development of democracy and the rise of Athens led to the passing away of this form of government, to revive with the general weakening of the Greek states. This later period of tyranny, which begins in the fourth century B.C., is not marked by so wide an extension of the evil, but, on the other hand, a few of the possessors of the power are men of extraordinary ability, who, having proved capable of restoring or rescuing an enfeebled state, have seized or been given the supreme control. Such were Dionysius I of Syracuse and Jason of Pheræ.

In general this second series of tyrants were more cruel and arbitrary than the earlier generation. The Thirty Tyrants (q.v.) of Athens were only an oligarchical board established in the interest of Sparta in 404 B.C., and owed the name "Tyrants" to later writers, their contemporaries referring to them as "The Thirty." Consult: Plass, *Die Tyrannis bei den Griechen* (Bremen, 1852); Zeller, *Ueber den Begriff der Tyrannis bei den Griechen* (Berlin, 1887); Schömann-Lipsius, *Griechische Alterthümer* (4th ed., ib., 1897).

TYRANT FLYCATCHER. See FLYCATCHER.

TYRANTS, THE THIRTY. See THIRTY TYRANTS, THE.

TYRCONNEL, tẽr-kŏn′el, RICHARD TALBOT, EARL and titular DUKE OF (1630–91). An Irish Jacobite. He was the youngest son of Sir William Talbot, of County Kildare, Ireland, a prominent Roman Catholic politician during the reign of James I. He fought against Cromwell at Drogheda and after the death of Charles I lived in Spain and Flanders. In his youth he was notorious as a sharper and bully and under the Protectorate he was recommended as a man fit to assassinate Cromwell. Soon after the Restoration he endeavored to obtain the favor of the royal family by blackening the reputation of Anne Hyde, so as to furnish the Duke of York with a pretext for breaking his promise of marriage to her. Though unable to injure her reputation, he succeeded in gaining the favor of the Duke, and contrived to make himself welcome at the palace both as a votary of its pleasures and as a counselor in affairs of state. Immediately on the accession of James II he was made Earl of Tyrconnel, and put in command of the troops in Ireland. He now aimed, by means of the Irish army, to make the King independent of Parliament. To this end he discharged Protestant soldiers, and favored Roman Catholics in every possible way, admitting them not only to the army, but to offices and corporations. This service he performed so well that in 1687 the King made him Lord Deputy of Ireland. His arrival in that country spread terror and dismay through the English Protestant population, who had already suffered under his military rule. Finding themselves without protection and their property a prey to marauders, many of them left the country, commerce declined, and economic conditions became wretched. But this state of affairs did not last long. On the arrival of James II in Ireland in 1689, after his flight from England, he created the Earl Duke of Tyrconnel. After the fatal battle of the Boyne (1690), in which the Duke held high command, he retired to France. In 1691 he returned to Ireland, to further the cause of James. Notwithstanding the defeat of Aughrim (July 12, 1691), and the capitulation of Galway, Tyrconnel made preparations for the defense of Limerick, binding himself and his countrymen by oath not to surrender until they received permission from James, then at St. Germain. At the same time, however, he dispatched a letter in which he stated his conviction that all was lost. On August 11, before an answer could arrive, he was stricken with apoplexy, and died on the 14th.

TYRE, tīr (Lat. *Tyrus*, from Gk. *Τυρός*, Aramic *Tur*, from Phœnician *Ṣūr*, rock). The most important city of ancient Phœnicia, on the Mediterranean coast about 50 miles south of Beirut (Map: Turkey in Asia, C 4). Its name comes from the double rock just off the coast, the site of the earliest settlement. This portion of the city is connected with the mainland by a causeway which dates from the days of Alexander the Great; before the Greek period, however, the older Tyre was an island divided by a natural canal. It has now been definitely ascertained that the old sanctuary to Melkart, the Baal or chief deity of Tyre, stood on the southwestern part of the little island, and, this being determined, priority of the island settlement over the adjoining coast is also determined. The city grew until it included as a suburb the adjoining coast land, and after the union of island and coast the entire place was known as the city of Tyre. From a strategic point, the situation of Tyre was favorable, while its admirable ports predestined it for its future commercial rôle. Those ports were chiefly two, the Sidonian port and the Egyptian harbor. Whether Tyre or Sidon is the oldest settlement of Phœnicia is not easily decided. The evidence is in favor of the latter, though the view formerly held, which made Tyre an offshoot of Sidon, must be abandoned in the light of recent researches. Herodotus records a tradition which traced the settlement of Tyre back to the twenty-eighth century B.C. The date may be too early, though when Egypt began her campaigns for the possession of western Asia under Thothmes I (c.1510 B.C.) Tyre was already flourishing and important. A new period of prosperity began for Tyre with the decline of Egyptian control (c.1400 B.C.), and though we know little of the history of the place for the next three centuries, the important position it occupied when Tiglath-pileser I or Assyria (c.1140–1105 B.C.) opened his successful series of campaigns to the West justifies the conclusion that in the interval Tyre more than maintained her supremacy over Sidon. It was a period of commercial extension, followed by a decline due to internal disturbances. It was not until c.870 B.C. that, so far as present knowledge goes, an Assyrian king, Asurnazirpal III, included Tyre and Sidon in his campaigns and obtained tribute from both, as well as from Byblos and Arvad. Among the kings of this period known to us from a list of Menander preserved by Josephus is Hiram from whom Solomon obtained material and workmen for his building operations. (See HIRAM; SOLOMON.) After the days of Asurnazirpal III, the compact between Tyre and Assyria remained uninterrupted, except for short intervals. To save her commerce and her position of supremacy, Tyre preferred to pay tribute rather than risk an encounter at arms with Assyria. In the days of Sennacherib (705–681 B.C.), however, Tyre paid for a manifestation of independence by an encounter with the Assyrian monarch, which ended in a momentary defeat for the Assyrians; but Tyre was cut off from communication with the coast, and after enduring a siege of five years, according to Menander, was obliged to submit (c.700 B.C.). Tyre recovered and entered in a combination with Egypt to resist the advance of Esarhaddon, the successor of Sennacherib, who had to content himself with receiving the homage of King Baal of Tyre without actually capturing the city; but Asurbanipal, his successor, may have succeeded towards the end of his reign (668–625 B.C.) in forcing the city to surrender. Tyre became an Assyrian vassal, but her commercial position was unaffected, and the fall of Assyria (c.606 B.C.) enabled her once more to assert her independence. Nebuchadnezzar II besieged the city for 13 years; at the end of that time (572 B.C.) he was forced to leave and seek compensation for his vain labors in Egypt. But Tyre was no doubt exhausted by the long siege, and her old rival Sidon profited by the loss of trade which followed, to take up the superior position in the commercial world. The last native ruler of Tyre was Ittobaal. Tyre fell into the hands of the Persians in the reign of Cambyses (c.527 B.C.). It still flourished in the Achæmenian period, sent large fleets as their contingents to the Greek wars, and formed with Sidon and Arvad a federal state having its capital at Tripolis.

It was taken by Alexander in 332 B.C. after a seven months' siege, and by Antigonus 17 years later, after a siege of 14 months. During the Roman period it was an important city with a famous university and a dominant Hellenistic type of civilization. During the early centuries of modern occupation it was again a centre of commerce and industry. It was captured by the Crusaders under Baldwin II in 1124 and remained in the hands of the Christians till 1291, when it was taken and destroyed by Malik al Ashraf, ruler of Egypt and Syria. It has never recovered its old importance. The present town (Ar. *Ṣûr*) has about 6500 inhabitants. Consult: Prutz, *Aus Phönizien* (Leipzig, 1876); Krall, "Studien zur Geschichte des alten Aegyptens, iii, Tyros und Sidon," in *Sitzungsberichte der kaiserlichen Akademie der Wissenschaften zu Wien*, vol. cxvi (Vienna, 1888); Friedrich Jeremias, *Tyrus bis zur Zeit Nebukadnezars* (Leipzig, 1891); Lucas, *Geschichte der Stadt Tyros zur Zeit der Kreuzzüge* (Berlin, 1896); Hugo Winckler, *Altorientalische Forschungen* (Leipzig, 1893–1906); Victor Bérard, *Les Phéniciens et l'Odyssée* (Paris, 1902–03); Landau, *Die Phönizier* (2d ed., Leipzig, 1903).

TYRE, Apollonius of. See Apollonius of Tyre.

TYRE, William of. See William of Tyre.

TYREE. See Tiree.

TYRIAN (tĭr'ĭ-*a*n) **PURPLE.** See Murex; Purple Shell.

TYRNAU, or **TIRNAU**, tĕr'nou (Hung., *Nagy-Szombat;* Slav., *Trnava*). A town of Hungary, on the river Trnava, 25 miles northeast of Pressburg (Map: Austria-Hungary, E 2). It has a cathedral, dating from 1389, and a large episcopal palace. Tyrnau has manufactures of cloth, linen, vinegar, sugar, and malt products, and has a general trade, especially in wine. Pop., 1900, 13,281; 1910, 14,759, mostly Slovaks and Magyars.

TYROL, tē-rōl'. A crownland of Austria. See Tirol.

TYROLIENNE, tē'rō'lyĕn' (Fr., Tyrolese). A Tyrolese dance, or dance song. It is best heard in the Zillerthal, in the Tyrolese Alps. A characteristic feature is the Jodler. See Jodeln.

TYRONE, tĭ-rōn' (Ir., *Tir-owen*, Owen's country). An inland county of Ulster, Ireland (Map: Ireland, D 2). Area, 1260 square miles. The principal rivers are the Blackwater, the Foyle, and the Mourne. The northwestern mountains rise in Slieve Sawel to a height of 2236 feet. Between Dungannon and Stewartstown there is a small but productive coal field. The soil of the plain is fertile; the hilly districts are sandy or gravelly, and devoted to pasturage. There are manufactures of linens and coarse woolens and earthenware. Pop., 1851, 255,700; 1901, 150,567; 1911, 142,665. The capital is Omagh.

TYRONE. A borough in Blair Co., Pa., 15 miles northeast of Altoona, on the Little Juniata River, and on the Pennsylvania Railroad (Map: Pennsylvania, E 6). It has considerable commercial importance, being an outlet for the Clearfield coal fields, and is noted especially for the manufacture of various paper products. There are also planing mills, and chemical and candy factories. Tyrone is an important railroad junction and has large repair shops. The Birmingham Female Seminary is 3 miles distant. Pop., 1900, 5847; 1910, 7176.

TYRONE, Hugh O'Neill, second Earl of (?1540–1616). An Irish soldier and revolutionist. He was the grandson of the first Earl, his father, who was illegitimate, being Baron of Dungannon. His elder brother was murdered in 1562, and Hugh became Baron of Dungannon, for precaution being sent to England. In 1568 he returned to Ireland, and for some years had difficulty in maintaining his position against his kinsmen. In 1580 he commanded a troop of horse in Munster against the rebel Earl of Desmond, and in 1583 was commander of the northern marches. In 1585 he was allowed to style himself Earl of Tyrone, and, strengthening his power in 1587, visited England to petition for a restitution of all lands granted to his putative grandfather by Henry VIII. He was unsuccessful, and, resenting the visit of commissioners sent to arbitrate his differences with his rival, Turlough Luineach, he attacked the latter, but was defeated. He was placed under restraint and afterwards pardoned, but he entered on intrigues to separate Ireland from England, offered the crown of Ireland to Philip II of Spain, and after a comparatively successful campaign, in which he defeated Sir John Norris, he killed his brother-in-law, Sir H. Bagnal, and effected a truce with the Earl of Essex. In 1601 he was worsted by Lord Mountjoy, surrendering to him early in 1603. He was soon after pardoned. In 1607, again suspected, he fled to Brussels, afterward proceeding to Rome, where he lived on a small pension allowed him by the Pope and the Spanish King. Consult John Mitchel, *The Life and Times of Aodh O'Neill* (New York, 1868).

TY'ROSINASE. See Enzyme; Oxidase.

TYROSINE, tĭr'ō-sĭn *or* -sēn. See Liver.

TYR'OTOX'ICON (Neo-Lat., from Gk. *τυρός*, *tyros*, cheese + *τοξικόν*, *toxikon*, poison). An alkaloid isolated from poisonous cheese, by Victor C. Vaughan, of Michigan, in 1885, and named by him in ignorance of the fact that Kuhn, of Leipzig, had given this name in 1824 to "a poisonous principle formed in cheese by putrefaction." The principle has been found in ice cream and cream puffs, as well as in milk.

The symptoms of tyrotoxicon poisoning are vomiting, diarrhœa, pain over the stomach, coated tongue, feeble and irregular pulse, pale and cyanosed face. In some cases the body is covered with spots. In others there is marked dryness and constriction of the throat. In all there is marked nerve exhaustion. The treatment of tyrotoxicon poisoning consists in emptying and flushing the digestive tract and supporting the heart.

TYR'RELL, George (1861–1909). A British Catholic theologian. He was born in Dublin and studied there at Trinity College in 1878, but in the following year became a member of the Roman Catholic church. Entering the Jesuit order in 1880, he took the required training and was ordained priest in 1891, and afterward was appointed an instructor in philosophy at St. Mary's Hall, Stonyhurst, England. In 1899, three years after his removal to London, his sympathy with some tendencies of modern religious thought became evident and prevented a complete acceptance of the principles of the order. Moreover, his later writings disclosed divergences from conservative Catholic theology, while his mysticism emphasized the religious life as transcending any doctrinal embodiment of it. The Jesuit authorities disapproved of him, and finally one of his privately printed letters on religious subjects, which had been translated and published in a Milan periodical, occasioned his expulsion from the order in February, 1906. About a year and a half later, his criticism in the London *Times* of the Pope's encyclical against modernism was the cause of his minor excommunication, with reserved case at Rome. Nevertheless, although deprived of his standing as a priest and a Jesuit, Tyrrell continued to maintain his liberal attitude and his distinction between the experiences of personal religion and their theological interpretation. In 1908 Cardinal Mercier of Belgium attacked him in his Lenten pastoral as the protagonist of modernism, and Tyrrell replied the same year in a volume entitled *Mediævalism*. Since he never retracted and his reserved case was not decided, he died virtually outside the pale of the Roman Catholic church. His other publications include: *Nova et Vetera: Informal Meditations* (1897; 3d ed., 1900); *Hard Sayings* (1898); *External Religion: Its Use and Abuse* (1899); *Oil and Wine* (1902; new ed., 1907); *Lex Orandi* (1903); *Lex Credendi* (1906); *Through Scylla and Charybdis* (1907), being the narrative of his religious development; and *Christianity at the Cross-Roads* (1909). Consult Hakluyt Egerton, *Father Tyrrell's Modernism* (London, 1909), and M. D. Petre, *Autobiography and Life of George Tyrrell* (2 vols., ib., 1912).

TYRRELL, James Williams (1863–). A Canadian civil engineer, born at Weston, Ont. He graduated in civil engineering at Toronto University in 1889, but before this date had had varied experience. In 1893 he went with his brother, Joseph Burr Tyrrell (q.v.), as topographer and interpreter on an expedition from Lake Athabasca through the Barren Lands to Chesterfield Inlet; and in 1900, at the request of the Department of the Interior, Ottawa, he took charge of an exploratory survey of the region between Great Slave Lake and Hudson Bay, traveling nearly 5000 miles by canoe and dog sled. He was elected president of the Ontario Land Surveyors' Association in 1905. He published: *Across the Subarctics of Canada* (1897; 3d ed., 1908); *Report on the Great Slave Lake-Hudson Bay Expedition of 1900.*

TYRRELL, Joseph Burr (1858–). A Canadian geologist and mining engineer. He was born at Weston, Ont., and graduated at Toronto University in 1880. Appointed (1881) an explorer on the Canadian geological survey staff, he took part, between 1883 and 1892, in expeditions in Manitoba and the Northwest, and in 1893–94 made notable journeys, largely through the unexplored north and northwest country, traveling over 6000 miles. (See Tyrrell, James Williams.) In 1898–1906 he was a mining engineer in Dawson City, next removing to Toronto. In 1896 the Royal Geographical Society awarded him the Back grant, and he was twice elected president of the Canadian Institute (1910, 1911). He wrote *David Thompson, Explorer* (1910), and edited Samuel Hearne's *A Journey from Prince of Wales's Fort in Hudson Bay to the Northern Ocean, in the Years 1769–72* (1911).

TYRRELL, Robert Yelverton (1844–1914). An Irish classical scholar, born at Ballingarry, County Tipperary, and educated at Trinity College, Dublin. He was appointed fellow of Trinity College in 1868, was made professor of Latin in 1871, and served as regius professor of Greek (1880–98), as professor of ancient history (1900–04), and then as registrar. He was a frequent contributor to English reviews, and edited and translated many classical works. Tyrrell received honorary degrees from several of the great universities. The most important of his works are: an edition, with Purser, of the *Correspondence of Cicero* (7 vols., 1879–1900); *Bacchæ* of Euripides (2d ed., 1897); *Troades* (2d ed., 1884); *Miles Gloriosus* of Plautus (2d ed., 1886); *Latin Poetry* (1893); *Sophocles* (1897); *Anthology of Latin Poetry* (1901); *Echoes of Kottabos* (1906), with Sir E. Sullivan; *Essays on Greek Literature* (1909).

TYRRHE'NIAN SEA (Lat. *Tyrrhenum mare*). That part of the Mediterranean Sea which is inclosed between the islands of Corsica and Sardinia on the west, Sicily on the south, and the Italian peninsula on the east (Map: Italy, C, D 4).

TYRTÆ'US (Lat., from Gk. *Τυρταῖος, Τύρταιος, Tyrtaios*) (fl. c.630 B.C.). A Greek lyric poet, famous for his political elegies and marching songs. According to Attic tradition, he was a lame schoolmaster of Aphidnæ, in Attica, of low birth, whom the Athenians, ignorant of his lyric power and jealous of the Lacedæmonians, sent to Sparta when the Lacedæmonians, at the advice of the Delphic Apollo, asked them for assistance against the Messenians. The tradition, however, is only the invention of a late time. Tyrtæus was no doubt a Spartan, or an Ionian who had moved to Sparta. By his poems he aroused the Spartans and led them to victory over their foes. The fragments of his work are published by Bergk, *Poetæ Lyrici Græci*, vol. ii (5th ed., Leipzig, 1914). See Embaterion.

TYRWHITT, tĭr'ĭt, Richard St. John (1827–95). An English writer on art. He graduated at Christ Church, Oxford, in 1849, and was a tutor from 1852 to 1856. Ordained in the English church, he was vicar of St. Mary Magdalen at Oxford from 1858 to 1872. Tyrwhitt had an uncommon artistic insight and exhibited several water colors that showed rare promise. But a lack of technical training led him to forego original painting for the interpretation of the work of others. Among his works are: *Concerning Clerical Powers and Duties* (1861); *Christian Art and Symbolism, with Hints on the Study of Landscape* (1872); *The Art Teaching of the Primitive Church* (1874); *Greek* *and Gothic: Progress and Decay in the Three Arts of Architecture, Sculpture, and Painting* (1881); *An Amateur Art Book: Lectures* (1886). He also published a novel and a volume of verse called *Free Field Lyrics* (1888).

TYRWHITT, Thomas (1730–86). An English scholar, born in London. He was educated at Eton and at Queen's College, Oxford, where he graduated in 1750. Five years later he was elected fellow of Merton, and called to the bar at the Middle Temple; but he never practiced law. From 1756 to 1762 he was Deputy Secretary of War, and from 1762 to 1768 clerk of the House of Commons. Both of these positions he resigned, for they interfered with his studies. Tyrwhitt is now best known for his edition of Chaucer's *Canterbury Tales* (4 vols., 1775; 5th vol., 1778). He also punctured (1778 and 1782) the bubble of the Rowley forgeries. His classical scholarship is represented by sundry dissertations on, and editions of, ancient authors.

TYSON, George E. (1829–1906). An American whaler and Arctic explorer, born in New Jersey. When already a whaler of extended experience, Tyson sailed as ice master of the *Polaris* American polar expedition under Hall in 1871. When the *Polaris* was shipwrecked in Smith Sound, Tyson and 18 of the crew were left adrift on the ice pack. Assuming command of the party, by his resourcefulness and seamanship he kept the men together and maintained their morale under desperate circumstances. They were rescued by the sealer *Tigress*, April 30, 1873, off the coast of Labrador after a drift of about 1800 miles during 196 days. An account of the drift is found in Blake, *Arctic Experiences Containing Capt. George E. Tyson's Wonderful Drift on the Ice-Floe* (New York, 1874).

TYSON, James (1841–). An American physician and pathologist, born in Philadelphia. At the University of Pennsylvania, where he graduated M.D. in 1863, he was professor of pathology and morbid anatomy from 1876 to 1889, dean of the medical faculty from 1888 to 1892, and professor of the practice of medicine from 1899 till his retirement in 1910, becoming well known especially through his earlier work in the cell theory and Bright's disease. He held the presidency of the Association of American Physicians (1907–08) and of the College of Physicians, Philadelphia (1907–10). Among his writings are: *The Cell Doctrine* (1870; 2d ed., 1878); *Introduction to Normal Histology* (1873); *Guide to the Practical Examination of Urine* (1875; 10th ed., 1902); *Treatise on Bright's Disease and Diabetes* (1881; 2d ed., 1904); *Manual of Physical Diagnosis* (1891; 4th ed., 1901); *The Practice of Medicine, a Textbook* (1896; 6th ed., rev. and rewritten, 1913); *Selected Addresses on Subjects Relating to Biography, Travel, etc.* (1914).

TYTLER, tĭt′lẽr, Alexander Fraser (1747–1813). A Scotch historical writer, and a judge of the Court of Session in Scotland under the title of Lord Woodhouselee. He was born in Edinburgh, where he was educated. In 1770 he was called to the Scottish bar. In 1780 he became professor of history in the University of Edinburgh; in 1790, judge advocate of Scotland; and in 1802 he was raised to the bench of the Court of Session. His writings include a biography of Henry Home, Lord Kames (1807); *The Decisions of the Court of Session* (1778); and the work by which he was best remembered, *Elements of General History* (1801).

TYTLER, Patrick Fraser (1791–1849). A Scotch historical writer, born in Edinburgh, the fourth son of Alexander Fraser Tytler, Lord Woodhouselee. He was educated in Edinburgh and in England, and was called to the Scottish bar in 1813. Three years later he was appointed King's counsel, but devoted himself chiefly to the production of various literary and historical works, the most valuable of which is his *History of Scotland* (1828–43), beginning at the accession of Alexander III and terminating at the union of the crowns—a book of more original research than any preceding work on the same subject. His writings also include *Life of James Crichton of Cluny, commonly called the Admirable Crichton* (1819); *Life and Writings of Sir Thomas Craig of Riccarton* (1823); *Life of John Wicliff* (1826); *Lives of Scottish Worthies* (1831–33); *Historical View of the Progress of Discovery on the More Northern Coasts of America* (1832); *Life of Sir Walter Raleigh* (1833); *Life of King Henry VIII* (1837); and *England under the Reigns of Edward VI and Mary* (1839), with the contemporary history of Europe. In consideration of his merits as an historian, Sir Robert Peel's government conferred on him a pension of £200 a year. Consult J. W. Burgon, *Life of Patrick Fraser Tytler* (London, 1859).

TYUMEN, tyōō-mân′y′. A town in Siberia. See Tiumen.

TZANA, tsä′nȧ, **TANA,** or **DEMBEA.** A lake in Abyssinia, situated between 11° 35′ and 12° 16′ north latitude, at a height of 5800 feet, and occupying an area of 1160 square miles (Map: Egypt, D 5). It is surrounded by volcanic mountains, receives over 30 affluents, and discharges its waters southward through the Blue Nile. It contains a number of inhabited islets.

TZAR. See Czar.

TZE-AN (1837–81). Senior wife of Hien-fung (q.v.), Emperor of China, and known as the Empress of the Eastern Palace, to distinguish her from Tze-hsi (q.v.), the Empress of the Western Palace, familiar in history as the Great Empress Dowager. Although Tze-an was the one legal wife of Hien-fung and in rank above the Western Empress, yet she was easily dominated by the more masterful Tze-hsi, to whose plans and ambitions, while both were Empresses Dowager, she offered no obstacles. She is remembered mainly because of her association with Tze-hsi.

TZE-HSI, TZU-HI, or **TZI-HI,** tzĕ-hē (1835–1908). The most famous woman in Chinese history, known as the Great Empress Dowager, and virtually the ruler of China for almost half a century. She was born in Peking of a Manchu family named Hweicheng, and belonged to the historic Nara or Nala clan, hence her name of Yehonala, which she bore when a child. In her sixteenth year she was selected for the Imperial harem of the Emperor Hien-fung (q.v.). She started as a *kwei-jen*, or concubine of the fifth rank. Because of her beauty and talents she was promoted to the fourth rank in 1854; in 1856 she was advanced to the third rank, and by 1858 she was second only to the first concubine Tze-an (q.v.), who became Imperial consort on the death of Hien-fung's legal wife. Practically uneducated when she entered the palace, she applied herself diligently to a thorough course in Chinese history, calligraphy, and classics, and became known as a fine scholar of the old school. On April 27, 1856, she gave birth to a son, afterward the Emperor Tung-chih (q.v.); this greatly increased her influence. She was now known as the Empress of the Western Palace. It was her almost unerring judgment of people and events which enabled her eventually to reach absolute power. On the death of Hien-fung she frustrated a conspiracy to put her out of the way, and together with Tze-an (q.v.), the Empress of the Eastern Palace, and Prince Kung she secured the overthrow of her enemies. She was then 26 years of age.

From that time she was the real ruler of China, remaining so during the reigns of Tung-chih (1861–75) and Kwang-sü (q.v.), to whom she married her favorite niece, also called Ye-honala. She had the political wisdom to select Li Hung Chang (q.v.) as her chief adviser, and later Li's protégé, Yuan Shih-kai (q.v.). These two men, together with Prince Kung and Prince Ching, helped her to direct her foreign policies. She was able to keep her country in fairly good standing among the nations of the world until the Chino-Japanese War (1894–95) revealed the weakness of China and the inability of the Chinese government to prevent territorial aggression. The result is found in the most critical period of Chinese history, from 1895 to 1902. First came the seizures, leases, and concessions of the Powers, which Tze-hsi was powerless to withstand. Then came the short-lived era of reform of the Emperor Kwang-sü in 1908, which Tze-hsi believed to be premature and therefore crushed, through her agents Jung-lu and Yuan Shih-kai. But she was not able to prevent the Boxer Rebellion, and although she at first disapproved of it, she later gave the Boxers encouragement and Imperial support. The tragic results of the Rebellion having taught Tze-hsi that the old order in China must be eradicated, from 1901 to 1908 she distinctly encouraged the modernizing of China, and also was in favor of constitutional government, which she promised should be granted in 1916. It was largely because of her determined stand that China threw off the opium curse, although Tze-hsi herself indulged occasionally. In 1908, just before her death, she designated Pu-yi (Hsuan-tung, q.v.), son of her nephew, Prince Chun (Tsai-feng, q.v.), as the next Emperor. She died Nov. 15, 1908, one day after the death of Kwang-sü.

Tze-hsi was ambitious and arbitrary, but, like Queen Elizabeth of England, was able to surround herself with good advisers and the ablest of her subjects. Remarkably patriotic, she never spared herself the grinding toil necessary to rule the Chinese world. Her character has been much maligned, especially by her enemies in south China, and as much overpraised by her admirers. She is one of the few women who have profoundly influenced the world's history.

Consult: K. A. Carl, *With the Empress Dowager* (New York, 1905); Bland and Backhouse, *China under the Empress Dowager* (Philadelphia, 1910); P. W. Sergeant, *The Great Empress Dowager* (New York, 1911); Paul Clements, *The Boxer Rebellion* (ib., 1915). See CHINA, *Modern History*.

TZENTAL, tsĕn′tăl. An ancient cultured nation of Mayan stock, occupying a large part of the states of Tabasco and northern Chiapas, in Mexico. Their traditional culture hero was Votan, who was said to have built the great ruins at Palenque (q.v.), in Chiapas, and their general civilization resembled that of the Maya and other cognate tribes. They still constitute an important part of the population of their ancient territory.

TZETZES, tsĕt′sēz, JOHANNES (Lat., from Gk. 'Ιωάννης Τζέτζης) (twelfth century A.D.). A Byzantine author and grammarian, who devoted himself to classical Greek literature. He was author of many works, both prose and verse, which have value as sources of classical information not available elsewhere. His principal writings are his poems *Iliaca*, which included the *Ante-Homerica*, *Homerica*, and *Post-Homerica*, and dealt with the entire Trojan tradition, and are best edited by Bekker (Berlin, 1816). His *Chiliades* is a didactic poem in 12,674 verses, divided into sixty chapters, treating of mythological, literary, and historical miscellanies. This huge work was provided by its author with explanatory scholia; it was edited by Kiessling (Leipzig, 1826). Other works are: a collection of 107 letters, his scholia to Hesiod, Aristophanes, Lycophron's *Alexandra*, Oppian's *Halieutica*, and some minor works. His elder brother, Isaak Tzetzes, was probably associated with him in preparing certain commentaries, and devoted himself particularly to the study of metric. Consult: K. Krumbracher, *Geschichte der byzantinischen Litteratur* (2d ed., Munich, 1897); H. Spelthahn, *Studien zu den Chiliades des Johannes Tzetzes* (ib., 1904).

TZINTZUNZÁN, chĭ′chōōn-chăn. A town of the State of Michoacán, Mexico, 28 miles west of Morelia, on Lake Patzcuaro. It is celebrated for its church containing a painting supposed to be an Entombment, by Titian, which is worshiped by the people.

TZONECA, tsô-nä′kä. See TSONEKAN.

TZSCHIRNER, chēr′nĕr, HEINRICH GOTTLIEB (1778–1828). A German Protestant theologian. He was born at Mittweida, Saxony; studied theology at Leipzig; became professor of theology at Wittenberg in 1805; at Leipzig in 1809; and prebendary of Meissen in 1818. He published *Protestantismus und Katholicismus aus dem Standpunkt der Politik betrachtet* (1822; 4th ed., 1824); *Das Reaktionssystem* (1824); and *Der Fall des Heidentums* (ed. by Niedner, 1829). Consult his *Life* by J. Goldhorn (Leipzig, 1828) and K. H. Pölitz (ib., 1828).

U

U The twenty-first letter of the English alphabet. The Phœnician alphabet ended with *t* (q.v.) and *u* was the first of the letters developed in Greek to supply the deficiency of the Phœnician. (For the early history of this letter, see Alphabet.) Originally U was the uncial and cursive form, and V the capital form. The two were differentiated about the fifteenth century A.D., when V was limited to representing the consonant sound. Before the fifteenth century small *v* and *u* were used interchangeably. In English *u* represents a variety of sounds besides its original value, which is that of a rounded back vowel, the *u* in *rude*. It stands also for the sound *yoo*, as *educate, mule, value*. It is pronounced like *ŏŏ* in *full, pull, push; û* in *Turk, turnip, urge; ŭ* (unrounded) in *tub, up, muff*. A *u* is always written after *q* (q.v.). In this case it has the consonantal value of *w*, which it has also often after other consonants, especially *g* and *s*, as in *quick, quartz, quote; language, anguish; suave, dissuade*. It is silent in *guard, tongue, build*, etc.

The sources of *u* are as follows: AS. *ŭ*, as *nut*, from *hnutu;* AS. *ū*, as *us* from *ūs*, *but* from *būtan*, *up* from *ūp;* AS. *ō*, as *must* from *mōste*.

In chemistry U stands for *uranium*. See Phonetics. Consult: Philippe Berger, *Histoire de l'écriture dans l'antiquité* (2d ed., Paris, 1892); W. Rippmann, *Elements of Phonetics* (London, 1910); Maurice Prou, *Manuel de paléographie latine et française* (3d ed., Paris, 1910); Henry Sweet, *The Sounds of English* (Oxford, 1908); Sir E. M. Thompson, *Introduction to Greek and Latin Paleography* (ib., 1912).

UAKARI, wȧ-kä'rē. See Ouakari.

UARAYCU, wȧ-rī'ko͞o. A peculiar tribe on the lower Jurua and Jutay rivers, and the adjacent portion of the Amazon, western Brazil. They whip their youths, and suspend maidens over a smoking fire, as tests of fortitude. Girls are betrothed in childhood, and the young man must hunt game for his bride long before he is permitted to marry her. They burn their dead and bury the ashes in their huts.

UARDA, o͞o-är'dȧ. The second of the Egyptian historical novels by Georg Ebers (1877). The action takes place in Egypt during the reign of Rameses II.

UAUPÉ, wä'o͞o-pā'. An extensive group of tribes, probably remotely of Arawakan stock (q.v.), residing on the Uaupés River, a head stream of the Río Negro, in southeastern Colombia. They cultivate corn, tobacco, manioc, cane, and bananas, are experts with the bow, lance, and blowgun, and are great fishermen. They live in large communal houses, sometimes nearly 100 feet square, with a roof nearly 40 feet high supported by columns hewn from tree trunks. They make pottery and baskets and use canoes hollowed out from logs. The men wear the G-string, feather headdresses, and amulets. The women go naked. Those of the same clan are not allowed to intermarry. Each communal household has its hereditary chief. In physique they are tall, stout, and well made. They are reputed to be very industrious.

UAUPÉS, wä'o͞o-pās'. A large tributary of the Río Negro, considered by some geographers as the true head stream of that river (Map: Brazil, C 3). It rises in the Eastern Cordillera of the Colombian Andes, descends in falls and rapids, and flows southeastward to its confluence with the main stream in northwest Brazil. It is over 700 miles long, and navigable in its lower course.

UBALDINI, o͞o'bȧl-dē'nē, Petruccio (?1524–?1600). An Italian illuminator and scholar of Tuscan birth. He went to England in 1545, and in the reign of Edward VI fought in the Scottish wars. At this period of his life he wrote *Relatione delle cose del regno d' Inghilterra* (1551), wherein he records his experiences of English manners and institutions. In 1580 he visited Ireland and compiled an account of the unsuccessful Spanish-Italian invasion of Kerry. His *Vita di Karlo Magno Imperatore* (1581) was the first Italian book printed in England.

UBANGI, ū-băn'gē. A river of Central Africa, the largest northern tributary of the Congo (Map: Congo, C 2). It is known also as the Mobangi (near its mouth), the Dua (19° to 20° E.), the Koyu (21° to 22° E.), and the Makua and Welle (in its upper course). The river rises in the extreme northeastern corner of Belgian Congo, not far from the Nile, and flows westward, then southward just above the Zongo rapids, and finally joins the Congo near the equator after a course of about 1500 miles. From its mouth to its confluence with the Mbomu at Yakoma, the Ubangi forms the boundary between French Equatorial Africa and the Belgian Congo. That part of the river known as the Welle was first discovered by Schweinfurth in 1870; some 10 years later Junker explored the Makua; in 1884 Hanssens discovered the mouth of the Mobangi; in 1885–86 Grenfell went up as far as the Zongo rapids, and within half a dozen years the several parts of the river already discovered were identified as the Ubangi. In great part the river flows through a populous country. Ubangi is also the name of a district in the northwestern part of Belgian Congo.

UBASTET, ōō-bäs′tĕt. An Egyptian goddess, called also Pasht or Pakht and, from the Greek form of the name of the city where she was especially worshiped, Bubastis or Bast. She was the wife of Ptah (see Memphis), and was identified by the Greeks with Artemis (see Diana). Her son was Tum, the solar deity of the western horizon. Beside her main seat of worship at Bubastis (q.v.) she was honored at Thebes (q.v.) and together with Ptah, at Memphis. Ubastet is usually represented as a woman with a cat's head; in earlier monuments she has the head of a lion. Her annual festival, held at Bubastis, was characterized by revelry with phallic accompaniments implying a fertility concept in the nature of the goddess. Her cult does not appear to have been ancient, but from the reign of Rameses III (q.v.), in the thirteenth century B.C., it became one of the most important in Egypt. See Bubastis, and illustration of *Pakht* in Plate of Egyptian Deities in the article Egypt.

ÚBEDA, ōō-bā-dä. A Spanish town of the Province of Jaén, in Andalusia, in the midst of the fertile Loma de Ubeda. It is 74 miles east of Cordova (Map: Spain, D 3). The country abounds in vineyards, olive plantations, and pasturages devoted especially to the rearing of horses. The town contains a castle with more than 20 towers, the sixteenth-century Church of San Salvador, and the Gothic San Pablo and Corinthian San Nicolás of lesser note, together with the Palacio de las Cadenas (in which are the municipal offices), and the edifice of the Colegio de Escolapios. The streets are broad and well paved and with the plazas well kept. The chief manufactures are pottery, leather, soap, and woolens. An important fair is held annually. Pop., 1900, 19,395; 1910, 22,341.

UBERTI, ōō-bĕr′tē, Fazio degli (born not later than 1310, died not earlier than 1368). An Italian poet, born in Pisa. A Ghibelline in politics, he lived most of his life as an exile at the courts of the Visconti (Milan) and the Scaligeri (Verona). His most ambitious work, the *Dittamondo* (i.e., dicta mundi, or things worthy of note in the world), a didactic poem in terza rima (q.v.), is noteworthy chiefly because in its methods it imitates the *Divina Commedia*. Like Dante, converted to righteousness in the middle of the path of life, Fazio feigns himself guided on a fantastic journey by the ancient geographer Solinus, from whose work and that of Pliny he borrows largely. He traverses nearly all the known world save Asia, narrating fables, traditions, legends, and various curiosities of Mediæval erudition. Save for a description of Rome the work is artistically barren. Some of his political satires, however, are spirited, and his love lyrics, with their reminiscences of the stil nuovo and even the Sicilian school, and with their yielding to Petrarchian influence, possess besides liveliness of fancy and some elegance of style. Consult: *Dittamondo* (Milan, 1826); R. Renier, *Le liriche edite e inedite di F. d. U.* (Florence, 1883); Pellizzari, *Il Dittamondo e la D. Commedia* (Pisa, 1905); Whitmore, "Fazio degli Uberti as a Lyric Poet," in *Romanic Review* (New York, 1914).

U′BIQUIST (from Lat. *ubique*, everywhere). A plant which grows in practically all habitats. The common dandelion, which grows naturally in light or shaded, moist or dry conditions, may be regarded as a typical example. The term cosmopolite refers to existence in all climates rather than all habitats.

UBIQ′UITY (from Lat. *ubique*, everywhere, from *ubi*, where). A term applied in theology to the doctrine that the Lord's body, in consequence of its personal union with the divine, by a "communication of properties," is everywhere present. This use of the word has its origin in the teachings of Luther, who, to defend the real presence of the entire Christ in the elements of the Lord's Supper, taught that Christ's body could be everywhere, although he called this presence "illocal." Consult literature under Luther.

UCAYALI, ōō′kī-ä′lē. A large river of Peru (Map: Peru, C 5), one of the main headstreams of the Amazon. From length and volume it should be considered as the true upper course of that river. It is formed by the junction of the Apurimac (q.v.), or Tambo, and the Quillabamba at the eastern base of the Andes between the departments of Junín and Cuzco, and flows northward in a winding course till it joins the Marañón in the northeastern part of Peru to form the Amazon. The length of the Ucayali proper is about 1000 miles, and with the Apurimac the length is nearly 1500 miles. Some of their sources are near Lake Titicaca, while that of the Mantaro, a tributary of the Apurimac, is in Lake Chinchaycocha or Junín (q.v.) within 100 miles of Lima, near the Pacific coast, and over 13,000 feet above the sea. So rapid is their flow that at their confluence the Ucayali proper is less than 1000 feet above sea level. Its later course through the densely forested montaño is sluggish, falling only 500 feet in nearly 1000 miles. Its banks are here very low, and it divides repeatedly into side channels, while large adjacent areas are periodically submerged. The Ucayali is navigable for large vessels, maintaining a depth of 40 to 70 feet for over 600 miles. Steamers can also ascend the Pachitea, the principal tributary below the confluence of the headstreams, over 200 miles to a point about 300 miles from Lima and 3600 miles from the mouth of the Amazon. The Ucayali thus affords an easy means of communication between the Atlantic Ocean and the heart of Peru.

UCCELLO, ōōt-chĕl′lō, Paolo, properly Paolo di Dono (1397–1475). A Florentine painter of the early Renaissance. The name Uccello was derived from his fondness for birds, which formed a part of his menagerie. It is not known with whom he studied painting, but he was perhaps influenced by Masaccio and certainly by Donatello. A pioneer of the so-called Florentine Realists, he was especially known for experiments in linear perspective and foreshortening. Wherever possible, his paintings are paradigms of perspective, and are often scientific rather than artistic productions. As they lack atmosphere, the figures seem immobile and clumsy. He excelled especially in portraiture; as in the fine equestrian portrait of the condottiere, Sir John Hawkwood, a fresco in grays in Florence Cathedral, and those of Giotto, Brunelleschi, Donatello, Manetti, and himself in the Louvre. In the cloisters of Santa Maria Novella he painted an interesting series of five frescoes of scenes from Genesis. His well known "Battle of San Romano," an early production, survives in the Uffizi, with others of like title in the Louvre and the National Gallery, London; and a quaint "St. George and the Dragon" is in private possession in Paris and Vienna. Other interesting works are a late "Hunting Scene at Night" (Oxford), the "Story of the Jew and the Host" at Urbino; and, according to Berenson, "A Man and Woman of the Portinari Family" in the Metropolitan Museum, New York. He exercised a determinative influence on the entire realist group, and on Piero della Francesca. Uccello's marked feeling for decorative design strongly influenced the decorative arts of his day. The four windows in the drum of Florence Cathedral are after his designs. Consult Giorgio Vasari, *Lives of the Most Eminent Painters, Sculptors, and Architects*, vol. i, Eng. trans. by Blashfield and Hopkins (New York, 1896), and Bernhard Berenson, *Florentine Painters of the Renaissance* (3d ed., ib., 1909).

UCHARD, ụ'shär', MARIO (1824–93). A French playwright and novelist, born in Paris. After following for some time the business of a stockbroker, he married in 1853 Madeline Brohan (q.v.) of the Théâtre Français, where he produced the drama *La Fiammina* (1857), which was very successful. His other plays attracted much less attention, but his novels won much favor. They include: *Raymond* (1861); *Le mariage de Gertrude* (1862); *La comtesse Diane* (1864); *Une dernière passion* (1866); *Mon oncle Barbasson* (1876); *Inès Parker* (1880); *Antoinette ma cousine* (1891); and others.

UCHATIUS, ụ-kä'tsĭ-ụs, FRANZ, BARON (1811–81). An Austrian general and inventor, born at Theresienfeld. Entering the Second Regiment of artillery in 1829, he became commandant of the ordnance works in the arsenal at Vienna in 1871, was made a major general in 1874, and lieutenant field marshal in 1879. He introduced an improved process of manufacturing steel in 1856, constructed several ballistic apparatus, especially one for measuring the pressure of gas in gun barrels, invented the so-called steel bronze (Uchatius metal), which was used for the equipment of the Austro-Hungarian field artillery, and in 1875 constructed the ring grenades, adopted since then by nearly all artilleries. Consult Lenz, *Lebensbild des Generals Uchatius* (Vienna, 1904).

U'CHEE, ū'chē, or **YUCHI,** yōō'chê. An interesting tribe, constituting a distinct linguistic stock, formerly centring on the middle Savannah River, in Georgia and South Carolina, but afterwards incorporated with the Creek confederacy. Very little is known of them, but evidence tends to substantiate their own claim that they were the autochthones of eastern Georgia and the adjacent region, antedating the Muskhogean tribes (see MUSKHOGEAN STOCK) by many years. They call themselves children of the sun, which, according to their myth, was their mother, and was worshiped with elaborate ceremonies. In 1739 Governor Oglethorpe concluded a treaty with the Uchee at their principal town, then on the Savannah River about 30 miles above Savannah. Before the end of the century they had removed to the Creek country, where in 1799 they had four towns with about 250 warriors, or, perhaps, 800 souls. Their main town was on the western (Alabama) side of the Chattahoochee, a few miles below the present Columbus. They participated in the treaties and wars of their Creek allies, and removed with them in 1835 to the Indian Territory. They now number but 38. Consult F. G. Speck, in University of Pennsylvania, *Anthropological Publications*, vol. i (Philadelphia, 1909).

UDAIPUR, ōō'dī-pōōr', or **ODEYPORE,** called also MEWAR, or MEYWAR. A native state of India, under British protection, in Rajputana (Map: India, B 4). Area, 12,756 square miles. Pop., 1901, 1,021,664; 1911, 1,293,776. The capital, Udaipur, situated 120 miles southeast of Jodhpore at an altitude of 2064 feet, had 47,587 inhabitants in 1911. Here is an imposing royal palace of marble and granite. Just south of the city is the fortified hill Eklingarh. The roads leading to the city are guarded by a series of fortresses, but these have fallen into a state of decay.

UDAL. See ODAL.

UDALL, ū'dal or **UVEDALE,** NICHOLAS (1505–56). An English schoolmaster and playwright. He was born in Hampshire. In 1524 he was graduated from Corpus Christi College, Oxford, and elected a fellow. He took an early and active part in the Reformation, but he trimmed his sails in the reign of Mary. From 1534 to 1541 he was head master of Eton, and from 1554 to 1556 head master of Westminster School. The fame of his various translations, pamphlets, and Latin and English verse has been eclipsed by his *Ralph Roister Doister*, an English comedy on the Roman model. It seems to have been composed for the boys at Eton before 1551, though, so far as is known, it was not published until 1566. It is the earliest English comedy now extant. Consult the reprint by E. A. Arber (London, 1869), and A. W. Ward, *English Dramatic Literature*, vol. i (rev. ed., ib., 1899). See GAMMER GURTON'S NEEDLE.

UDDER, INFLAMMATION OF THE. See MAMMITIS.

UDDEVALLA, ụd'de-väl'lȧ. A port of Sweden, situated at the head of the Byfjord, 48 miles north of Göteborg (Map: Sweden, E 7). It has a school of navigation, and manufactures cotton goods and furniture. There are also sugar refineries, wood-pulp mills, and granite quarries. Pop., 1901, 9442; 1910, 12,583.

UDINE, ōō'dê-nȧ. The capital of the Province of Udine, Italy, in a fertile, highly cultivated plain on the Roja Canal, 84 miles by rail northeast of Venice (Map: Italy, D 1). It consists of an inner and an outer town separated by fortifications. The streets are crooked and narrow, but it is an agreeable city. In the centre of the town rises a hill crowned by a castle, now used as a barracks, dating from 1517. The chief square lies at the southern base of the hill. The imposing municipal palace, in the style of the Doges' Palace of Venice, contains a large marble statue of Ajax, and some excellent mural paintings. The Romanesque cathedral possesses a finely sculptured portal. Udine has a handsome theatre, a splendid archiepiscopal palace with historic memories, a school of industrial arts, and a technical institute. There is a small public garden, and the artistic house of the painter Giovanni da Udine is shown. In the Palazzo Bartolini there are a municipal museum of antiquities, paintings by Giovanni da Udine, and a library of over 88,000 volumes and 3120 manuscripts. Udine is in one of the most unique and beautiful districts in the world. The city manufactures silks, velvets, leather, metal ware, paper, and sugar. The chief trade is in flax and hemp. Pop. (commune), 1901, 37,942; 1911, 47,617.

Udine, the ancient Utina, was an important city in the Middle Ages. In the thirteenth century it became the capital of Friuli. In 1420 it passed to Venice. Near Udine is the small but interesting town of Cividale del Friuli (q.v.), the ancient Forum Julii. Udine was the base of the Italian campaign against Austria in the great war which broke out in 1914. See War in Europe.

UDO, o͞o'dô (*Aralia cordata*). A Japanese vegetable suitable for wide cultivation for its blanched, edible shoots. The plants are bushy and yield edible shoots for about nine years. They should be planted about 3 to 4 feet apart and cultivated like asparagus. The shoots are blanched by mounding with earth, or covering with closed drain tile early in the spring. The shoots may be prepared for the table in the same manner as asparagus. See Aralia.

UEBERWEG, ṳ'bĕr-väG, Friedrich (1826–71). A German philosopher, born at Leichlingen, Prussia. He was educated at Göttingen and Berlin, and in 1862 was made professor of philosophy at Königsberg, where he remained till his death. His most important works are his *System der Logik und Geschichte der logischen Lehren* (1857; 5th ed., 1882; Eng. trans. of the 3d ed. by Lindsay, London, 1871), and his *Grundriss der Geschichte der Philosophie* (1863–66; 10th ed., rev. by M. Heinze, 1910 et seq.; Eng. trans. of the 4th ed. by Morris, New York, 1871), which is one of the most valuable histories of philosophy in moderate compass ever published, and is unrivaled in the fullness of its bibliography; *Schiller als Historiker und Philosoph* (Leipzig, 1884). Consult F. A. Lange, *Friedrich Ueberweg* (Berlin, 1871); M. Brasch, *Die Welt- und Lebensanschauung Friedrich Ueberwegs nebst einer biographisch-historischen Einleitung* (Leipzig, 1889).

UECHTRITZ, ṳK'trĭts, Friedrich von (1800–75). A German dramatic poet and novelist, born at Görlitz, Silesia. He studied jurisprudence at Leipzig and held various judicial positions at Treves and Düsseldorf. Of several tragedies, for the most part technically weak, *Alexander and Darius* (1827), with a preface by Tieck, was produced in Dresden, Berlin, and Vienna. *Das Ehrenschwert* also met with a favorable reception. The dramatic poem *Die Babylonier in Jerusalem* (1836), while little adapted to the stage, is distinguished by brilliant diction. His best-known novels are *Der Bruder der Braut* (1860), a religious-patriotic tale, and *Eleazar* (1867), a romance of the great Judean war. He also published *Blicke in das Düsseldorfer Kunst- und Künstlerleben* (1839–42). Consult *Erinnerungen an Friedrich von Uechtritz und seine Zeit in Briefen von ihm und an ihn* (Leipzig, 1884), with a preface by Sybel, and W. Steitz, *F. von Uechtritz, als dramatischer Dichter* (Görlitz, 1909).

UECHTRITZ, Kuno von (1856–1908). A German sculptor, born at Breslau. He studied at the Vienna Academy under Tilgner, to whose influence is to be attributed his fondness for the baroque and rococo styles, manifest in his early portrait busts. Subsequently he turned to polychrome work, carrying it from softer tints to thoroughly naturalistic treatment. of which an "Italian Pifferaro with his Monkey" is an example. After his removal to Berlin in 1886 he took up decorative and monumental sculpture, earning reputation with several fountain designs, enlivened by mythological, ideal, and genre figures, and animals, and displaying a subtle sense of humor. For the Siegesallee he executed the group with the statue of Elector George William (1899), and for Breslau the Moltke Monument.

UFA, o͞o'fȧ. A government of east Russia. Area, 47,130 square miles (Map: Russia, J 4). The east portion has a mountainous surface, being traversed by offshoots of the Ural Mountains, running in densely wooded ridges parallel to the main mass. The western part has a steppelike appearance with an incline towards the Kama. This river forms the west boundary line of the government, and its navigable tributary, the Byelaya, intersects it from southeast to northwest. The climate is severe, but healthful. Ufa is a highly mineralized region containing deposits of iron, copper, coal, petroleum, sulphur, etc. Mining industries are little developed. Agriculture employs only a part of the population, as the inhabitants are stock breeders and nomadic. About one-third of the area is cultivated, producing rye, oats, and wheat. The holdings are generally large, and the use of improved machinery is increasing. An important dairy product is kumiss. The manufacturing industries are connected to a large extent with mining, and the chief iron and steel works are situated at Zlatoust (q.v.). Other manufactures are spirits, leather, soap, and candles. Pop., 1912, was 2,988,500, of whom the Russians constituted about 45 per cent of the total, the remainder consisting of Bashkirs, Tatars, and Meshtcheryaks.

UFA. The capital of the Government of Ufa, in east Russia, situated on the Byelaya, near its junction with the Ufa, 326 miles by rail east-northeast of Samara (Map: Russia, J 4). Pop., 1910, 103,485.

UFFIZI (o͞o-fēt'sē), Palazzo Degli. A celebrated Florentine palace, containing one of the finest collections of sculpture and painting in the world. It was erected in 1560–76, after the designs of Giorgio Vasari, for the government offices of the Grand Duchy of Tuscany. The ground story is one of the most beautiful open halls of Italy; it is roofed with barrel vaulting supported by heavy Doric pillars which extend the height of the entire façade. The top story, now containing the gallery, was originally an open loggia. In the vestibule and court are many statues of celebrated Tuscans.

The nucleus of the gallery was a part of the celebrated collections made by the Medici in the fifteenth century. Additions were acquired or inherited by many of the Medicean dukes, and the collection was bequeathed to the state by the last representative of the line in 1737. It is especially rich in antique statuary, possessing the celebrated Niobid group, the "Boy Drawing Out a Thorn," the "Apollino," the "Medicæan Venus," "Satyr," "Wrestlers," "The Grinder," and "Dying Alexander." The collection of paintings is the most important in Italy, and for Italian painting the greatest in the world. It includes numerous works by artists of the early Florentine Renaissance, such as Fra Angelico, Filippo and Filippino Lippi, Domenico Ghirlandaio, and especially Sandro Botticelli, to whom a room is dedicated. The High Renaissance is well represented by Michelangelo, Fra Bartolommeo, Andrea del Sarto, Raphael, Giorgione, Titian, and Correggio, the gallery being especially rich in masterpieces of Titian and Raphael. There is also a fine collection of Flemish and Dutch masters. The celebrated "Tribuna" of the Uffizi is an octagonal room containing many of the masterpieces of the collection. There is also an excellent collection of drawings, published in three series of 11 volumes and eight series of four volumes (Florence, n. d.). An interesting feature of the gallery is a unique collection of portraits of great masters by themselves. A passageway connects the Uffizi with the Pitti collection. (See PITTI PALACE.) The second story of the Uffizi contains the Biblioteca Nazionale, containing 300,000 volumes and 14,000 manuscripts. Its nucleus was the Magliabechiana collection, to which, in 1862, was added the Royal Library of the Pitti Palace. The Uffizi also houses the Florentine state archives, one of the richest collections of documents in the world. Consult C. C. Heyl, *The Art of the Uffizi Palace* (Boston, 1912), and P. G. Konody, *The Uffizi Gallery* (ib., 1912).

UGANDA (ōō-gän'dȧ) **PROTECTORATE.** A British protectorate in British East Africa, consisting of the native kingdom of Uganda and several adjacent states (Map: Congo, F 2). The protectorate covers 121,437 square miles, of which 16,377 are water.

Uganda is a remarkably diversified country, with snow peaks, elevated plains, vast forests, low swamps, and arid depressions. The variety of climate it offers is likewise exceptionally great. The Lake Rudolf region in the northeast has an average altitude of 2000 feet, is tropically hot, and is a barren and unpromising section. The Mount Elgon region and that north of the Victoria Nyanza in the southeast are much more favorable to development, owing to the ample rainfall and well-watered conditions. But the climate here is generally damp, hot, and productive of malarial fevers. This region, westward of the extinct volcano Mount Elgon—a gigantic mass 14,200 feet high, with a crater about 10 miles wide—has an average elevation of some 4000 feet, and possesses dense forests, marshes, and many good agricultural districts. The course of the Nile from the Ripon Falls (its exit from the Victoria Nyanza) through Lake Kioga to the confluence of the waters from Lake Albert is within or contiguous to this region. The western part of the protectorate, separated from the Belgian Congo by the Albert and Albert Edward lakes, the magnificent snowy Ruwenzori (q.v.), whose highest summit, Alexandra, is 16,794 feet high, and the deep-forested valley of the Semliki, forms a region rich in possibilities. Splendid plateaus and charming small lakes abound here. Cooling breezes make much of this region not only habitable, but inviting. In the Nile valley to the north, below Lake Albert, the heat is extreme, the rainfall abundant on the windward slopes of the ranges. The northern part of the protectorate is generally forbidding. The waters of the many lakes which characterize the protectorate are partly fresh and partly salt.

Except in the Rudolf district, the flora, which is in general kindred to that of West Africa, is rich and abundant, but there is no oil palm. Papyrus covers the swampy Nile valley. The lofty mountains explain the presence of the alpine vegetation in the higher parts, and of the witch-hazel and trees of kindred classes on the plateaus. Uganda has a peculiar long grass, from 10 to 15 feet high, which is used for building purposes by the natives. The fauna is allied to that of equatorial Central Africa and the Congo basin, in conformity with the moist and forested character of the region. A list of the birds and quadrupeds would include most of those of Africa which are not strictly desert or seacoast forms. Lions and leopards are numerous, living upon antelopes and wild and tame cattle; and the rivers and lakes abound in crocodiles, feeding upon the fish, many of which are wholesome for food. There are no anthropoid apes, but many monkeys, of which the guerza is most notable. Large collections of insects and land shells have been made, but a great deal remains to be learned of the smaller life of the region.

In the eastern sections of the protectorate granite and gneiss of Archæan age are prominent; in the central regions, quartz, sandstone, and basalt are added; around Lake Rudolf lava and tuff are superimposed on the foregoing formations. Iron ore is abundant and widely distributed. Gold occurs northwest of Lake Rudolf, and graphite in Buganda and Bunyoro. The soil is very fertile, except in the Rudolf region. Among the Baganda, a remarkably efficient people, now largely Christian, not a little has been done towards improving the country by building substantial houses, making good roads, etc. The most important product commercially is cotton, the output of which has increased rapidly in recent years; the estimated area under cotton in 1913–14 was upward of 110,000 acres, and the export was 6467 tons, valued at £317,687. Other products are coffee, peanuts, cacao, ivory, and hides. Trade is chiefly in the hands of the natives and British Indians. Imports of merchandise (including goods in transit) increased from £168,911 in 1904–05 to £897,262 in 1913–14, and exports (exclusive of goods in transit) from £60,378 to £524,260. The so-called Uganda Railway is wholly within the East Africa protectorate. From Port Florence, the terminus of this railway on Victoria Nyanza, a steamer service is maintained with Entebbe, Jinja, and Port Bell in Uganda. A railway extends 8 miles from Port Bell to Kampala. The Busoga Railway extends 54 miles from Jinja around the Nile rapids to Kakindu, and thence 8 miles to Namasagali, both these towns being on the Nile. Thence steamers ply to Lake Kioga, again on the Nile, and on Albert Nyanza.

The protectorate of Uganda is divided into five provinces: Rudolf, Eastern, Northern, Western, and Buganda. These provinces are subdivided into districts. Almost the entire protectorate outside of the Rudolf province is now under direct British administration; but the native chiefs are permitted, and in fact encouraged, to administer the government of their own subjects. The province of Buganda is recognized as a native kingdom. The King, whose title, "Kakaba," is hereditary, is assisted by three native ministers and by a native assembly "Lukiko." This government is well organized and efficient, and the dynasty can be traced back to about the year 1400. Similar rights and privileges are conceded to the chiefs of Bunyoro, Toro, and Ankole. For Europeans and non-natives justice is administered by British courts. The British administration is in the hands of a governor, whose headquarters are at Entebbe. The capital of the kingdom of Buganda is Mengo, about 20 miles north by east of Entebbe. The revenue and expenditure of the protectorate were £256,559 and £290,180 in 1913–14. Deficits are covered by British grants in aid.

The population of the protectorate was estimated, March 31, 1914, at 2,909,122, including 2,904,454 natives, 3651 Asiatics, and 1017 Europeans (of whom 256 females). The Baganda, numbering about 650,000, have many churches and schools.

The natives of the protectorate may be classified as Negritos or Pygmies, Bantus (q.v.), Nilotic negroes, Hamites, and Masai (q.v.), though most of them are probably mixtures in varying degree of these different types. The Pygmies are not numerous, a few being found in that part of the Congo forest which is included within the limits of the protectorate. The Bantus, who in general are an agricultural people, make up nearly half the population. The Hamites are represented by a few tribes in the islands and on the north shore of Lake Rudolf, and by the pastoral Wahuma or Bahima, probably of Galla ancestry (see Gallas), who more than 100 years ago conquered the Bantu agriculturists, and at present, more or less mixed with Bantu blood, form the aristocracy and ruling classes. They are purest in the western part of the protectorate, where there are also a few separate Bahima tribes. The Masai are met with in the Rudolf region, the Suk and Turkana tribes being good representatives. The Nilotic negroes occupy the Nile Province and a large part of the Central Province, reaching the Victoria Nyanza in Kavirondo. Negro tribes also extend southward along the Albert Nyanza, especially on the west side, the Semliki River, and the Albert Edward Nyanza to the extreme southwest corner of the protectorate.

The Uganda protectorate was formed initially of the once powerful native kingdom of Uganda, which has been in the British sphere of influence since 1890. The protectorate dates from 1894. The region was first visited by a European (Captain Speke) in 1862. Stanley passed through Uganda in 1875.

Bibliography. Speke, *Journal of the Discovery of the Source of the Nile* (Edinburgh, 1863); Taylor, *The Lake Regions of Central Africa* (New York, 1875); Wilson and Felkin, *Uganda and the Egyptian Sudan* (London, 1882); Elisée Reclus, *Géographie universelle*, vol. xiii (Paris, 1888); Richter, *Uganda* (Gütersloh, 1893); Colville, *Land of the Nile Springs* (London, 1895); Scott-Elliott, *A Naturalist in Mid Africa* (ib., 1896); Ashe, *Two Kings of Uganda* (2d ed., ib., 1897); Ansorge, *Under the African Sun* (ib., 1899); Lugard, *The Story of Uganda* (ib., 1900); Purvis, *Handbook of British East Africa and Uganda* (ib., 1900); Kollmann, *The Victoria Nyanza* (ib., 1900); Sir H. H. Johnston, *The Uganda Protectorate* (ib., 1902); *Handbook for East Africa, Uganda, and Zanzibar* (Mombasa, 1903); A. B. Lloyd, *Uganda to Khartoum* (New York, 1906); H. M. Stanley, *In Darkest Africa* (2 vols., ib., new ed., 1913).

UGOGO, ū-gō'gô. A district of German East Africa, about 170 miles west of that part of the coast opposite Zanzibar (Map: Congo, G 4). It is a bare, arid plateau, about 3500 feet in altitude, inhabited by the Gogo, or Wagogo, a warlike Bantu tribe.

UGOLINO DA SIENA, o͞o'gô-lē'nô dȧ syā'nȧ. A name appearing in the early annals of Sienese painting and once thought from its different designations to apply to four persons. It is probable, however, that the Ugolino da Siena who was influenced by Duccio and Cimabue, and who died at an advanced age in 1339, was identical with Ugolino di Neri and Ugolino di Pietro, mentioned in Sienese records of 1317 and 1324. The only work attributed to him with any degree of probability is part of an altarpiece which was painted for Santa Croce at Florence, two panels of which are now in London.

UGRIANS, o͞o'grĭ-*a*nz. A term often used to designate a subdivision (closely related to the Finns) of the Ural-Altaic stock, which included the Ostiaks, Voguls, and Magyars. See Ural Altaic.

UHDE, o͞o'd*e*, Fritz von (1848–1911). A German historical and genre painter, born at Wolkenburg, Saxony. He began his artistic studies at the Dresden Academy in 1866, but, finding himself at variance with the spirit prevailing there, followed a military career until 1877, when again he took up painting at Munich, giving his attention especially to the old Dutch masters. In 1879 he removed to Paris, where he worked for a short time in Munkácsy's studio, but principally studied from nature and Dutch models. A result of these combined influences was the "Family Concert" (1881, Cologne Museum). The new coloristic principles which he in the meanwhile adopted are apparent in the "Arrival of the Organ Grinder" (1883), and, turning now to religious subjects, he created those remarkable and pathetic masterpieces "Suffer the Little Children to Come unto Me!" (1884, Leipzig Museum) and "Come, Lord Jesus, and Be Our Guest" (1885, National Gallery, Berlin), both scenes in a workingman's cottage. He next produced "Christ with the Disciples at Emmaus" (1885, Städel Institute, Frankfort), "The Sermon on the Mount" (1887), the triptych of the "Nativity" (1889, Dresden Gallery), and "The Walk to Bethlehem" (1890, New Pinakothek, Munich), a bold modern conception of the subject. Uhde brought about a complete change in German art, counting among his followers most of the younger generation. His later productions include: "Noli me tangere" (1894, New Pinakothek, Munich), "The Wise Men from the East" (1896, Madgeburg Museum), "The Last Supper" (1897, Stuttgart Museum), "Richard III," "Ascension" (1898, New Pinakothek, Munich), and "Woman, Why Weepest Thou?" (1900, Vienna Museum), the altarpiece of the Lutherkirche, Ziorchan (1905), and "Going Home" (1908). Uhde is known for his attempt to bring back German art to the ancient religious ideals. Like the primitive painters he depicts with deep religious feeling, yet with powerful naturalism and highly poetic treatment of light and atmosphere, the personages of the New Testament in the lowly garb of the German working classes. He also portrays the woes of laboring people. Consult the monographs by Lücke (Leipzig, 1887), Graul (Vienna, 1893), Bierbaum (Munich, 1893), Meissner (Berlin, 1900), and for reproductions of all his works, Rosenhagen, in *Klassiker der Kunst* (Stuttgart, 1908).

UHLAND, o͞o'länt, Ludwig (1787–1862). A distinguished German poet, philologist, and literary historian. Born at Tübingen, April 26, 1787, he studied jurisprudence there in 1802–08, at the same time cultivating mediæval literature, especially old German and French poetry, the study of which he pursued for eight months in Paris. On his return he began the practice of law at Stuttgart, worked in the Ministry of Justice, and when in 1815 Württemberg was to be granted a new constitution, his lyrics in praise of liberty were enthusiastically received. As a member of the Legislature from 1819 to 1839 he sided with the opposition. In 1848 he was elected to the German National Assembly, but in 1850 retired from political life and settled at Tübingen, devoting himself exclusively to literary pursuits. From 1829 to 1833 he had held the professorship of German literature at the University of Tübingen. As a lyric poet Uhland is remarkable for truth and simplicity of sentiment and his picturesque view of nature. His ballads and romances rank among the most precious ideal treasures of the German nation. During his early life he labored to revive the ballad. None has caught the spirit of the old folk song more fully than he. Of his songs the most widely popular are "Der Wirtin Töchterlein" and "Der gute Kamerad"; of the ballads, "Das Schloss am Meer," "Das Glück von Edenhall," "Des Goldschmieds Töchterlein," "Roland Schildträger," "Der schwarze Ritter," and "Des Sängers Fluch" are in all anthologies. He was the first poet of the Swabian school who sought to combine purity of style with brevity and vigor, and to give romantic sentiment to all. Although poetically effective, his glorifications of German faith, the dramas *Ernst, Herzog von Schwaben* (1817) and *Ludwig der Bayer* (1819) lack dramatic action and had only moderate success. Uhland was a founder of Germanic and Romance philology. Besides the treatise *Ueber das altfranzösische Epos* (1812), and an essay *Zur Geschichte der Freischiessen* (1828), there are to be especially mentioned *Walther von der Vogelweide, ein altdeutscher Dichter* (1822); *Der Mythus von Thôr* (1836), the result of painstaking original investigation; and the masterly collection *Alte hoch- und niederdeutsche Volkslieder* (1844–45; 3d ed., 1892). His poetical works were repeatedly published as *Gedichte und Dramen*, while his scientific work is embodied in *Schriften zur Geschichte der Dichtung und Sage*, edited by Holland, Keller, and Pfeiffer (1865–72). Consult: Mayer, *Ludwig Uhland, seine Freunde und Zeitgenossen* (ib., 1867); id., *Ludwig Uhlands Leben: Aus dessen Nachlass und aus eigener Erinnerung zusammengestellt von seiner Wittwe* (ib., 1874); H. Dederich, *Ludwig Uhland als Dichter und Patriot* (Gotha, 1886); W. L. Holland, *Zu Ludwig Uhlands Gedächtnis* (Leipzig, 1886); H. Fischer, *Ludwig Uhland: eine Studie zu seiner Säkularfeier* (Stuttgart, 1887); Bernhardt, *Uhlands politische Betätigung* (1910); A. Hartmann, *Ludwig Uhland* (Stuttgart, 1913).

UHLAND, Wilhelm Heinrich (1840–1907). A German engineer and writer on technology, born in Nordheim, Württemberg. In 1865 he founded the Technikum Mittweida, the first private institution for the instruction of machinists, and in 1868 organized the Technikum Frankenberg, near Chemnitz. He invented numerous appliances for industrial use. He founded and became editor of the periodical *Der praktische Maschinen-Konstrukteur*, and wrote: *Handbuch für den praktischen Maschinen-Konstrukteur* (1883); *Skizzenbuch für den praktischen Maschinen-Konstrukteur* (16 vols., 1867–95; 2d ed., 1906); *Die Corliss- und Ventildampfmaschinen* (1879); *Die Telephonanlagen* (1881); *Dampfmaschinen mit Schiebersteuerung* (1881); *Die Woolfschen und Compounddampfmaschinen* (1882); *Die Hebeapparate* (1882–83); *Das elektrische Licht und die elektrische Beleuchtung* (1884); *Die Brotbäckerei, Biskuit- und Teigwarenfabrikation* (1885).

UHLICH, ōō'lĭk, Leberecht (1799–1872). One of the founders of the German "Free Congregations" (q.v.). He was born at Göthen, Anhalt, studied at Halle, and served as pastor in various places till 1847, when he withdrew from the Evangelical church, and thenceforth was preacher of the Free Congregation at Magdeburg. In 1841 he became the leader of the "Protestant Friends," or "Friends of Light." His liberal views frequently involved him in difficulties with the authorities. He published *Bekenntnisse* (4th ed., 1846); *Christentum und Kirche* (2d ed., 1846); *Die Throne im Himmel und auf Erden* (1845); *Handbüchlein der freien Religion* (7th ed., 1889). His autobiography appeared at Gera in 1872.

UHO, ōō'hō. See Moho and Oo.

UHRICHSVILLE, ū'rĭks-vĭl. A village in Tuscarawas Co., Ohio, midway between Pittsburgh and Columbus, on Big Stillwater Creek, and on the Pittsburgh, Cincinnati, Chicago, and St. Louis, and the Baltimore and Ohio railroads (Map: Ohio, H 5). It derives considerable commercial importance from its situation in a farming and stock-raising region, and has several large sewer-pipe and fire-clay plants. Coal is mined extensively. Pop., 1900, 4582; 1910, 4751.

UIGURS, wē'gụrz. A people of East Turkestan, and of Turkic stock. They founded the powerful Kingdom of Hiong-Nu, which reached its zenith in the first century A.D., when it was divided into a northern and a southern empire. The latter was destroyed by the Tunguses in the third century, whereupon the southern Uigurs retreated to the west and founded the Empire of the Huns (q.v.). In the eighth century the northern Uigurs founded a kingdom which was destroyed by the Kirghizes. In the fifth century A.D. their culture, developed on the slopes of the Tian Shan, was in a flourishing condition, and about this time they underwent considerable Buddhistic and Chinese influence, their religion having already been modified to some extent by Nestorian Christians, from whom they adopted the traces of Zoroastrianism present among them. But they finally adopted the faith of Islam, and have been modified in blood and other characteristics by more recent Mongol-Chinese, Arab, and Turkic elements. Time has deprived the Uigurs of their independent nationality and much of their peculiar culture. Probably from Uigur influence the Mongols and Manchus have adopted the Syrian system of writing, and other advances in the culture of the numerous tribes of Central Asia and Siberia are, perhaps, from the Uigurs. Consult: Klaproth, *Abhandlungen über die Sprache und Schrift der Uiguren* (Paris, 1820); Vámbéry, *Uigurische Sprachmonumente und das Kudatku Bilik* (Leipzig, 1870); Schott, *Zur Uigurenfrage* (Berlin, 1875); Radloff, *Aus Sibirien* (Leipzig, 1893); id., *Ethnologische Uebersicht der Türkenstämme Sibiriens und der Mongolei* (ib., 1883); id., *Die alttürkischen Inschriften der Mongolei* (St. Petersburg, 1899).

UIN'TATHE'RIUM (Neo-Lat., from Eng. *Uintah*, mountain range in Utah + Gk. *θηρίον*, *thērion*, dim. of *θήρ*, *thēr*, wild beast). An extinct and blunt-toed (amblypod) ungulate mammal, found fossil in the Eocene fresh-water deposits of the western United States. The animal was about the size of a rhinoceros, with a large narrow head. The skull of the male is armed with two pairs of bony hornlike protuberances, the larger hinder pair being supported by crests of bone that slope up towards them from points near the orbits. There are two small knobs on the end of the nose. Upper incisors are absent and the upper canines of the male are enlarged to form drooping recurved tusks. The eyes were small. The brain cavity is small, indicating a ratio between weight of brain and that of body of about 1 to 4000, which is exceptionally low for a mammal.

UIST, wīst, North and South. Two islands of the Outer Hebrides, situated south of Lewis-with-Harris and 15 to 30 miles west of Skye (Map: Scotland, A 2). They are separated by the smaller island of Benebecula. North Uist is 18 miles long and 3 to 10 miles wide; South Uist is 22 miles long and 7 miles wide. The western parts of both are fertile and productive and the inhabitants engage in agriculture and cattle raising, as well as fishing. Pop., 1911, of North Uist, 3753; of South Uist, 5109.

UITOTAN, wė-tŏ'tan. An Indian linguistic stock of Colombia, South America. The Uitoto dwell on the upper Yapura River. Consult Koch-Grünberg, in *Zeitschrift für Ethnologie,* vol. xxxviii (Berlin, 1906), and id., *Zwei Jahre unter den Indianern* (ib., 1909–10).

UJ-BECSE, o͞o'y'-bĕ'chĕ. See Becse.

UJFALVY, o͞o'y'-fȧl-ve, Karl Eugen (1842–1904). An Austrian philologist, anthropologist, and traveler, born in Vienna of an old Hungarian noble family. Educated in the military academy at Wiener-Neustadt, he served as lieutenant in the army until 1864, when he went to study at the University of Bonn. Going to France in 1867, he was appointed professor in the Oriental Academy in 1873, and by order of the French government undertook three scientific expeditions into Central Asia, in 1876–82, the results of which were published in *Expédition scientifique française en Russie, en Sibérie, et dans le Turkestan* (3 vols., 1878–80). Among several ethnological and linguistic essays, there are to be noted: *La langue magyare, son origine, etc.* (1871); *La migration des peuples, etc.* (1873); *Mélanges altaïques* (1874), and others. After 1884 he devoted himself to art-historical researches and published in that field *Les biscuits de porcelaine* (1893).

UJHELY, Satoralja. See Satoralja-Ujhely.

UJI, o͞o'jė. A well-known suburb of Kyoto, Japan, the ancient capital of the Empire. Uji lies on the Uji River where it breaks through the gorge as it issues from Lake Biwa. The pretty village is surrounded by ancient and famous tea plantations. Pop., less than 20,000.

UJI (Jap., maggot). The Japanese name for a parasite of the silkworm, a tachinid fly (*Leskia sericaria*). It is said by Sasaki that the eggs of the parasite are laid upon the mulberry leaves and are eaten by the worms, after which the larva hatches out and feeds in the interior of the worms in the same way as do the larvæ of tachina flies. The life history is thus very abnormal, since with other species the eggs are laid upon the body of the caterpillar or other host insect. This parasite sometimes does considerable damage in Japan, but fortunately has not reached other silk-raising countries.

UJIJI, o͞o-jē'jė. A town situated on the east shore of Lake Tanganyika, Africa (Map: Congo, F 3). It is the terminus of the railroad from Dar-es-Salaam at the coast, some 743 miles long, and was formerly an important slave market. Here Stanley found Livingstone in 1871. Pop., about 8000.

UJI-YAMADA, o͞o'jė-yä'mȧ-dȧ. A town in the Prefecture of Miye, central Hondo, Japan, 73 miles by rail south of Nagoya (Map: Japan, E 6). It is filled with inns and hotels for the accommodation of the pilgrims to the near-by Isé shrines. Pop., 1898, 27,990; 1908, 37,539.

UJJAIN, o͞o-jīn' (Skt. *Ujjayinī,* City of Victory, Gk. 'Οζήνη, *Ozēnē*), or Oojein. A town of Malwa, in the State of Gwalior, Central India, on the right bank of the Sipra (Map: India, C 4). It has an active trade in opium, cotton, and grain. It was formerly encircled by a wall six miles in circumference and was one of the seven sacred cities of India; it has a spacious bazar, a grand palace of the Maharaja Sindhia, and other important monuments. Ujjain is said to have been the viceregal seat of Asoka (q.v.) during his father's reign at Patna, but is better known as the capital of the Samvat (q.v.) Kingdom founded by Vikrama (q.v.). It was the capital of Sindhia from 1750 until the seat of government was removed to Gwalior in 1810. Pop., 1901, 39,892.

ÚJVIDÉK, o͞o'y'vī-dāk. A town in Hungary. See Neusatz.

UKASE, ū-kās' (Russ. *ukazŭ,* edict, from *ykazati,* to order, indicate, from *y,* in, by, near, connected with Gk. *ἐν, en,* Lat. *in,* in + *kazati,* to show), or Ukas. A term applied in Russia to all orders or edicts, legislative or administrative, emanating from the government. The ukases either proceed directly from the Emperor, or are published as decisions of the directing Senate. In either case they have the force of laws till annulled by subsequent decisions. A collection of ukases in 48 volumes was made by order of Czar Nicholas in 1827, and has been supplemented from time to time. These, eliminating such as are unimportant or of temporary authority, constitute the present legal code (*svod*) of the Russian Empire.

UKEREWE, o͞o'kȧ-rā'wȧ. See Victoria-Nyanza.

UKHTOMSKY, ụk-tôm'skė, Esper Esperovitch, Prince (1861–). A Russian author and poet, born near Oranienbaum, of an old princely family. In 1884 he was appointed to a position in the Ministry of the Interior. His *Travels in the East of Nicholas II* (London, 1896–1902), a splendidly illustrated work, published in Russian, English, French, and German, describes three journeys on which he accompanied the Czar. Besides many lyric poems, he contributed book reviews and critical and historical essays to periodicals, and in 1896 assumed the editorship of the *Sanktpeterburgskiya Viedomosti,* in which he advocated an energetic Russian policy in eastern Asia.

UKIYO-YÉ, o͞o'kyō-yā' (Jap., pictures of the passing world). The name of the modern popular school of painting in Japan, founded by Hokusai (q.v.) and continued by his pupils and successors. The beginning of the movement may be traced as far back as the end of the sixteenth century, when droll sketches were made by Iwasa Matahei (1577–1650). Towards the close of the eighteenth century Okyo painted fowls, fishes, and monkeys, their naturalism giving an immense impulse to the popularization of art.

The most common form of Ukiyo-yé is the nishiki-yé, "brocade pictures," and it is the art of the common people. Consult: Anderson, *Descriptive and Historical Catalogue of Chinese and Japanese Art* (London, 1886); Frank Brinkley, *Japan: Its History, Arts, and Literature* (8 vols., Boston, 1910); E. F. Fenollosa, *Epochs of Chinese and Japanese Art* (2 vols., New York, 1911).

U'KRAINE. A name formerly applied to a part of the old Kingdom of Poland, comprising portions of the present Russian governments of Podolia, Kiev, Techernigov, Ekaterinoslav, and Kherson, the whole of Poltava, and part of Galicia. By the Treaty of Andrussovo in 1667 the portion to the left of the Dnieper and Kiev passed to Russia, and later became known as Little Russia. The remainder was acquired by Russia at the second partition of Poland in 1793.

UKRAINIANS, ū-krān'ĭ-*a*nz, or Little Russians (*Malorussians*). A Slavic people numbering about 35,000,000 inhabiting the southeast of Russia (especially the governments of Volhynia, Kiev, Podolia, Kherson, Ekaterinoslav, Kharkov, Poltava, and Chernygov) and parts of Austria-Hungary. (See Ruthenians.) Compared with the Great Russians, the Ukrainians are taller, darker, and more brachycephalic and show a marked difference in temperament, manners, and customs. The Ukrainians of Russia belong to the Greek church, while those of Austria are mostly Uniates.

The early history of Russia in so far as it centres about the State of Kiev is in fact Ukrainian history. (See Russia, *History.*) The Ukrainian principality of Galicia (Halich) which was founded in the twelfth century was annexed to Poland in the fourteenth. About the same time Ukrainian Kiev and Volhynia were wrested by Lithuania and later incorporated in Poland. Polish discipline, however, availed little against the turbulent Ukrainian Cossacks. In 1654 Khmelnitski, or Chmielnicki (q.v.), hetman of the Zaporogian Cossacks allied himself to Czar Alexei Mikhailovich and for 100 years the Zaporogian military republic (Sich) enjoyed autonomy under the protectorate of Russia. Catharine II, however, destroyed it in 1775. The partition of Poland brought under the Russian crown all the Ukrainian lands except Galicia. See War in Europe.

The dialects spoken by the Ukrainians differ from Great Russian (see Russian Language) by such phonetic changes as *i* for Russian *ě*(*ie*); *h* for *g;* another *i* sound for primary *o* and *e* in closed syllables; etc. The early literature of Kievite Russia (see Russian Literature) was largely Ukrainian literature. The modern Ukrainian literature, as distinct from the Russian, was inaugurated in 1798 by Kotliarevsky (q.v.) and illustrated by such writers as the poet Shevchenko (q.v.) and the novelists and story-writers Storozhenko (1817–74), Levitski-Nechui (1838–), Panas Mirny, and Evdotia Panaev-Stanitski (1820–93). With the seventies the centre of Ukrainian literary activity was shifted to Galicia, where the Ukrainians could write without fear of government interference. The most distinguished modern writers are Boris Grinchenko (1863–1910), Ivan Franko (1856–), the novelist Kotsinbinski (died 1913), the poets Konisski (1836–1900) and Lesia Ukrainka (died 1903), and the dramatist Tobilevich (1845–1907).

Bibliography. In Russian: the histories of Efimenko (St. Petersburg, 1906); Kovalevski (ib., 1912); Grushevski's *Survey* (3d ed., Kiev, 1911) and his *Illustrated History of the Ukraine* (St. Petersburg, 1913); Pogodin, *The Slavic World* (Moscow, 1915); in Ukrainian: Grushevski's *History of the Ukrainian People* (Kiev, 1904– ; vol. i in Ger. trans., Leipzig, 1906). Periodicals: Ruthenische Revue (Vienna, 1903–05), continued as *Ukrainische Rundschau;* Revue Ukrainienne (Lausanne, 1915 et seq.); *Annales des Nationalites* (Paris, issue of March, 1913) and *Svoboda* of Feb. 29, 1916 (Jersey City). The propagandist literature in English on the so-called Ukrainian Question is fairly large. Mention may be made of Fedorchuk, *Memorandum* on *The Ukrainian Question* (London, 1914); Bedwin Sands (A. Raffalovich), *The Ukraine* (ib., 1914), containing a good bibliography; Steffen, *Russia, Poland and The Ukraine* (New York, 1915); and *Ukraine's Call to Freedom* (ib., 1915). There are literary histories and monographs by Franko (Lemberg, 1910), Efremov (Kiev, 1911), Ogonovski (Lemberg, 1884–86), N. Petrov, and Zhitetski; in German, Pypin and Spasovich, *Geschichte der slavischen Literaturen*, vol. i (Leipzig, 1880). Further, Pypin, *History of Russian Ethnography*, vol. iii (St. Petersburg, 1900); Grinchenko, *Literature of Ukrainian Folklore;* Levitski, *Galician Russian Bibliography of the Nineteenth Century* (Lemberg, 1888–89); *Literaturno-Naukovy Vistnik* (ib., 1898 et seq.).

ULBACH, ụl'bȧsh', Louis (1822–89). A French novelist, born at Troyes. He began his career as a journalist and took part in several violent controversies, the most notable of which concerned his accusation that Edmond About (q.v.) in his novel *Tolla* had been guilty of plagiarism. Ulbach was appointed librarian of the Arsenal Library in 1875. He wrote many popular novels, including: *M. et Mme. Fernel* (1860); *La ronde de nuit* (1874); *Le crime de Martial* (1880); *Le marteau d'acier* (1882); *Autour de l'amour* (1885); *La maîtresse du général* (1887), and *Le parrain de Cendrillon* (1888).

ULCER (from Lat. *ulcus*, Gk. ἕλκος, *helkos*, sore, ulcer, wound). An open sore; a superficial solution in the continuity of the soft parts. The tendency of an ulcer is towards continued dissolution of the tissues in which it exists, rather than towards healing, as in the case of an ordinary open granulating wound, the latter being less frequently (though properly) called an ulcer. They are usually classified according to character and mode of origin into simple and specific or infective ulcers. Infective ulcers may result from such infective diseases as syphilis, tubercle, leprosy, and glanders. Among the simple ulcers may be mentioned a number of varieties, such as the *traumatic* or *inflammatory*, the *varicose* or *chronic*, the *erethritic* or *irritable*, the *perforating* or *trophic*, the *callous* or *indolent ulcer*, the *hemorrhagic*, the *phagedenic*, and the *fungous ulcer*.

The structures to which ulceration is usually limited are the skin and mucous membranes. Upon the surface of an ulcer a layer of inflammatory exudate is found, mingled with fragments of broken-down tissue or tissue in a state of coagulation necrosis. Beneath this lies a layer of granulation tissue, composed of polynuclear leucocytes and epithelioid cells, with relatively little intercellular substance, but richly supplied with a network of capillary blood vessels, and forming the base of the ulcer. Below this there is usually found some of the fibrous tissue of the deeper layers of the skin. The edges of the ulcer consist of the surrounding skin, more or less altered by inflammatory changes. The margins of an ulcer are occasionally undermined by the ulcerative process, or they may become firmly adhesive to the periosteum of bone or other subjacent structures. The varicose ulcer, the form most commonly seen by the surgeon, is situated usually on the front of the leg, above its lower third. Around it are generally seen the numerous dilated and congested veins whose condition is responsible for the ulcerative process. Passive hyperæmia and its resultant enfeebled nutrition are the fundamental causes of ulceration in this locality.

The treatment of ulceration in general may be regarded as constitutional and local. Constitutional treatment consists in fresh air, nourishing diet, proper hygienic surroundings, administration of iron where anæmia exists, and appropriate medication for any specific constitutional disease that may be present. Tuberculous ulcers are often healed rapidly by exposure to the sunlight. Local treatment consists in rest and elevation of the part, antiseptic measures, and the application of special local forms of treatment adapted to the conditions present at the site of ulceration. Bandaging, strapping, and the application of various stimulating substances are the measures generally employed. An ointment of "scarlet red," an anilin dye, is often applied to hasten epithelial growth. Consult: E. M. Foote, *A Textbook of Minor Surgery* (New York, 1914); E. Adams, *Treatment of Chronic Leg Ulcers* (ib., 1914); J. C. DaCosta, *Modern Surgery* (7th ed., Philadelphia, 1914).

ULEÅBORG, ụ'lĕ-ō-bôr'y'. The northernmost government of Finland, Russia (Map: Russia, C 1). Area, 63,954 square miles, or 44 per cent of the area of Finland. The surface is densely wooded and interspersed with lakes and marshes. The climate is very severe. The chief industry is lumbering. There are also some metal works and tanneries. Pop., 1912, 326,900, almost exclusively Finns.

ULEÅBORG (Finnish, *Oulu*). The capital of the Government of Uleåborg, in Finland, Russia, on the Gulf of Bothnia, 498 miles by rail north of Helsingfors (Map: Russia, C 2). Its trade includes produce, coal, iron, salt, raw hides, and timber. Pop., 1913, 21,000.

ULEMA, ụl'ā-mä (Ar. *ulamā*, pl. of *ālim*, learned, from *alima*, to know). The lawyers of Islam. This religion has no ecclesiastical ministry, as any one of the Faithful may lead a congregation in prayer as Imam. But, as theoretically every detail of life is to be guided by the letter of the Koran, along with all the approved traditions and orthodox interpretations, there is the necessity of a class of men learned in the canon law, to act as advisers of the Faithful in all these emergencies. The Ulemas, therefore, correspond most closely to the class of the Scribes or Rabbis in Judaism. Their province is now confined to a limited field in the Turkish Empire. By dictating details of domestic life, they wield vast authority over the people, and stand independent of, and often opposed to, the secular government. They are recruited mostly from the lower classes. The candidates go up to the schools or universities, where the scholar remains three or four years, passing successively through the disciplines of grammar, dogma, and law. He may also pursue logic, rhetoric, etc. The great Mohammedan university is that of Cairo. The order is hierarchically graded. Above the lowest class stand the muftis and mollahs (qq.v.).

U'LEX. See FURZE.

U'LEXITE (named in honor of G. L. Ulex, a German chemist). A hydrated sodium and calcium borate that occurs in rounded masses, consisting of fine fibres. It has a silky lustre, and is white. It is an important source of borax.

ULFELDT, o͞ol'fĕlt, KORFIZ, COUNT (1606–64). A Danish adventurer. Through marriage with Leonora Christina, the natural daughter of King Christian IV, he rose to high office, being made governor of Copenhagen and royal steward (1643). He retained his influence after the accession of Frederick III, the enmity of whose Queen, however, forced him in 1653 to flee to Sweden. In 1657 he fought against his native country, and by the Treaty of Roskilde (1658) was restored to his estates. After many vicissitudes he died a fugitive near Basel, Feb. 20, 1664. His wife was kept a prisoner at Copenhagen from 1663 to 1685, and wrote an account of her captivity in *Jammers Minde*, a notable specimen of Danish prose. She died in 1698. Consult Ziegler, *Denkwürdigkeiten der Gräfin Leonora Christina, vermählten Gräfin Ulfeldt* (Vienna, 1879).

ULFILAS, ŭl'fĭ-las, Gothic **WULFILA**, wụl'fĭ-lȧ (little wolf) (c.311–c.383). Bishop of the Goths, and translator of the Bible into Gothic. He was born in Dacia. Tradition relates that his ancestors were Cappadocian Christians who had been taken captive by the Goths and lived many years among them. Early in life he was a *lector* or reader of the Scriptures among his countrymen, and in 341 he was consecrated Bishop of the West Goths by Eusebius of Nicomedia (q.v.) at a synod at Antioch. He was then and for the remainder of his life an Arian. For seven years he worked with much success as a missionary north of the Danube. In 348 the persecution of a heathen chief compelled Ulfilas and his flock to emigrate, and, with the consent of the Emperor Constantine, they settled in Mœsia, in Byzantine territory south of the Danube. For more than 30 years Ulfilas continued his activity as the apostle to the Goths; he died at Constantinople, whither he had been summoned by the Emperor. Ulfilas had a good knowledge of Greek, Latin, and Gothic, and preached and wrote in all three languages. He is remembered chiefly for his translation of the Bible, which marks not only the beginning of Christianity among his people, but of Germanic literature as well. His plan is said to have included the entire Bible with the exception of the Books of Kings, which he thought contained too much about wars for the good of his fierce countrymen. The portions of his work which have been preserved are most of the four Gospels, the Second Epistle to the Corinthians, and other fragments, comprising the greater portion of the New Testament; of the Old Testament, portions of the Books of Nehemiah and Genesis only. The chief manuscript is the so-called *Codex Argenteus*, written with silver letters on purple parchment and now in the library of the University of Upsala. Editions of all the fragments have been published by Von der Gabelenz and Löbe (3 vols., Leipzig,

1843–46); Uppström, *Codex Argenteus*, in facsimile (Upsala, 1854–57); *Fragmenta Gothica Selecta* (ib., 1861); *Codices Gothici Ambrosiani* (Stockholm, 1868); Bernhardt (Halle, 1875); Heyne (9th ed., Paderborn, 1896); Stamm (11th ed., ib., 1908). Consult also: W. Bessell, *Ueber das Leben des Ulfilas und die Bekehrung der Goten zum Christentum* (Göttingen, 1860); C. A. A. Scott, *Ulfilas: Apostle of the Goths* (London, 1885); *Cambridge Mediæval History*, vol. i (New York, 1911).

ULLATHORNE, ŭl'á-thôrn, WILLIAM BERNARD (1806–89). An English Roman Catholic prelate, born at Pocklington, Yorkshire. He went to sea in 1821, entered the Benedictine monastery at Downside, near Bath, in 1823, and took the vows in 1825. Ordained a priest in 1831, he was vicar general at Sydney, Australia, in 1833–36; returning to England, he agitated against the transportation system in 1836–38; and then spent two more years in Australia. In 1841 he was placed in charge of a mission at Coventry, in 1845 became Bishop of the west of England. From 1850 to 1888, when he retired, he served as Bishop of Birmingham. His writings on religious subjects include: *The Endowments of Man* (1882); *The Groundwork of the Christian Virtues* (1883); *Christian Patience* (1886). Consult his *Autobiography* (London, 1891).

ULLMANN, ụl'män, KARL (1796–1865). A German Protestant theologian. He was born at Epfenbach, Bavaria, and studied theology at Heidelberg and Tübingen. He was appointed professor at Heidelberg in 1821. In connection with Umbreit he established in 1828 the *Theologische Studien und Kritiken*. He was professor at Halle, 1829–36, after which he returned to Heidelberg. He was president of the supreme ecclesiastical council of Baden, 1856–61. His most important works were *Gregor von Nazianz* (1825; 2d ed., 1867); *Die Reformatoren vor der Reformation* (1841; 2d ed., 1866; Eng. trans., 1877); *Ueber die Sündlosigkeit Jesu* (7th ed., 1863); *Das Wesen des Christenthums* (5th ed., 1865), all of which were translated into English. His chief writings were published in five volumes (Gotha, 1863–67). Consult his *Life* by Beyschlag (Gotha, 1867).

ULLOA, ụl-yō'á, ANTONIO DE (1716–95). A Spanish statesman and scientist, born at Seville. He entered the Spanish navy, and in 1735 accompanied to South America the French scientific expedition sent out to measure a degree of the meridian at the equator. He became rear admiral in 1760, went to Louisiana as Governor in 1764, and was made lieutenant general of the naval forces in 1770. He was sent on a secret expedition against Florida, but his zeal as naturalist made him forget his sealed orders and brought him before a court-martial (1780). He was acquitted, but lived in retirement. He wrote the important work *Noticias americanas, entretenimientos fisico-históricos sobre la América Meridonal y la Septentrional Oriental* . . . (Madrid, 1772).

ULLOA'S RING. See ANTHELIA.

ULLSWATER, ŭlz'wa̤'tẽr. The largest of the English lakes, after Windermere, lying between Cumberland and Westmoreland, 10 miles east of Keswick (Map: England, D 2). Length, 8½ miles; breadth, ¼ to ¾ mile. Its scenery is rugged and grand, and one of its chief features is Helvellyn.

ULM, ụlm. A city of the Kingdom of Württemberg, Germany, and an important Imperial fortress, at the junction of the Iller and the Blau with the Danube, which here becomes navigable, 43 miles west of Augsburg (Map: Germany, D 4). Two bridges unite the city with New Ulm, a village on the Bavarian side of the Danube. The streets are narrow. The minster (a Protestant church) is the most important and beautiful example of late Gothic architecture in Germany, and next to Cologne Cathedral is the largest church in that country. It is 407 feet long, 159 feet broad, and the spire (finished 1890) is 530 feet high. The building was begun in 1377, and finished, except the spire, in 1494. The leading industries are flax, cotton, and woolen weaving; bleaching; the manufacture of paper, leather, and mixed fabrics; beer brewing, shipbuilding, printing, etc. Ulm is famed for ornamental pipe bowls, its pastry, called Ulmer bread, and its trimmed lumber. Pop., 1910, 56,109. Ulm was a free Imperial city as early as the twelfth century, and had become very prosperous by the close of the Middle Ages. In 1530 the city accepted the Reformation, and the majority of the people have since been Lutherans. In 1802 Ulm was attached to Bavaria, and became part of Württemberg in 1810. Here on Oct. 17, 1805, the Austrian general Mack surrendered to the French with about 23,000 men. Consult: Pressel, *Ulmisches Urkundenbuch* (Stuttgart, 1873); Loeffler, *Geschichte der Festung Ulm* (Ulm, 1883); Schultes, *Chronik von Ulm* (ib., 1886).

UL'MIN. See HUMUS.

UL'PIAN (DOMITIUS ULPIANUS). A distinguished Roman jurist, a citizen of Tyre, who lived in the latter part of the second and the first part of the third century. Under Septimius Severus (193–211 A.D.) he became assessor in the auditorium of Papinian, i.e., he was an associate justice when Papinian was prætorian prefect or Chief Justice of the Empire. Under Caracalla, who put Papinian to death, Ulpian retained his position; but Elagabalus stripped him of his dignities and exiled him from Rome. On the accession (222 A.D.) of the youthful Alexander Severus, to whose mother he was related, Ulpian was recalled, appointed guardian of the Emperor and prætorian prefect, and became the virtual Regent of the Empire. He was slain in 228 A.D. in a rising of the Prætorian Guard. Ulpian was one of the most prolific of the Roman legal writers. Besides voluminous commentaries on the civil law and on the prætorian edict, he published collections of cases (opinions, responses, etc.), books of rules and institutions, treatises on the powers and duties of different magistrates, and many monographs. On account of the lucidity of his style, Justinian's compilers drew more largely upon his writings than upon those of any other jurist. Excerpts from his works constitute one-third of the *Digest*. Outside of Justinian's *Digest*, only one of Ulpian's books has been even partially preserved, viz., his monograph on rules (*Liber Singularis Regularum*), which appears to have been a handbook for practitioners. It is frequently printed with the *Institutes* of Gaius, as in Muirhead's edition (Edinburgh, 1880), and in that of Abdy and Walker (3d ed., Cambridge, Eng., 1885). See CIVIL LAW; JURISCONSULT.

ULRICH, o͞ol'rĭk (1487–1550). Duke of Württemberg. He was the son of Count Henry IV, and at the age of 11 succeeded to the dukedom, assuming personal power in 1503. He added to the territory of Württemberg, but so impoverished the peasantry that in 1514 they rose in revolt. This he quelled only after many important concessions. By the murder of Hans von Hutten, brother of Ulrich von Hutten, he aroused the enmity of the dukes of Bavaria and the nobility. He was placed under the ban of the Empire, and was driven from the country by the Swabian League in 1519, and his possessions were sold by the league to Charles V, who transferred them afterward to his brother Ferdinand. Ulrich went over to the Protestants, and with the aid of Philip of Hesse won back his dukedom, at the head of an army of 20,000 men (1534), but only as a fief of Austria. He then carried on the work of the Reformation, joined the Schmalkaldic League, and fought against Charles V in 1546. He bought a precarious peace from the Emperor at great cost, and died in 1550 just as he was again threatened with deposition. Consult Kugler, *Ulrich, Herzog zu Württemberg* (Stuttgart, 1865).

ULRICH, ŭl'rĭk, Charles Frederick (1858–1908). An American painter. He was born in New York City and studied there at Cooper Institute and the National Academy, and afterward in Munich. In 1883 he was awarded the Thomas B. Clarke prize for his picture "In the Land of Promise," and was elected an associate of the National Academy. His pictures, which are detailed in treatment and minutely finished, include "The Carpenter," "A Dutch Typesetter," "The Wood Engraver," and "Glass Blowers of Murano" (Metropolitan Museum, New York).

ULRICH, Edward Oscar (1857–). An American paleontologist, born at Cincinnati, Ohio. He studied at German Wallace College, Berea, Ohio, and at Ohio Medical College. He was curator of geology for the Cincinnati Society of Natural History in 1877–81, served as paleontologist to the geological surveys of Illinois, Minnesota, and Ohio between 1885 and 1896, and after 1897 was geologist of the United States Geological Survey. For ten years he was an associate editor of the *American Geologist*. His publications include: *American Palæozoic Bryozoa* (1884); *American Palæozoic Sponges and Palæozoic Bryozoa* (1890); *Geology of the Lead, Zinc, and Fluor Spar District of Western Kentucky* (1904); *A Revision of Palæozoic Systems* (1911).

ULRICH VON HUTTEN, ụl'rĭk fōn hụt'-ten. See Hutten, Ulrich von.

ULRICH VON LICHTENSTEIN, lĭk'ten-stīn (c.1200–76). A German minnesinger, born in Styria, of an ancient noble race, and who was Landeshauptmann of Styria in 1245, headed the refractory Styrian nobility, and went through a terrible imprisonment in his own castle of Frauenburg. His chief work, *Frauendienst* (1255), is valuable for the history of civilization. It describes many tournaments and foolish adventures, which he, a married man and an otherwise sensible gentleman of good reputation, claims to have undertaken in the service of a high-born mistress. Unintentionally it reduced the decadent woman cult of the day to an absurdity. However, it contains some graceful lyrics. The *Frauendienst* was published by Bechstein in two volumes (Leipzig, 1888). Consult also Falke, *Geschichte der füssleichen Hauses Lichtenstein*, vol. i (Vienna, 1868); Knorr, *Ueber Ulrich von Lichtenstein* (Strassburg, 1875); Becker, *Wahrheit und Dichtung in U. von Lichtensteins Frauendienst* (Halle, 1888).

ULRICH VON TÜRHEIM, tụr'hīm. A Swabian noble and epic poet of the thirteenth century. Of the details of his life nothing is known. He continued, using other sources, Gottfried von Strassburg's *Tristan und Isolde*, and Wolfram von Eschenbach's *Willehalm*. The former is conjecturally dated 1240, the latter, entitled *Der starke Rennewart*, 1250. Consult: Bechstein, *Tristan und Isolde* (Leipzig, 1875); Lohmeyer, *Die Handschriften des Willehalm Ulrich von Türheim* (Halle, 1882); and article by O. Kohl in *Zeitschrift für deutsche Philologie*, vol. xiii (ib., 1882).

ULRICI, ụl-rē'tsē, Hermann (1806–84). A German philosopher, born at Pförten, Brandenburg. He studied at Halle and Berlin, and after a brief career as a lawyer devoted himself exclusively to literature and philosophy. In 1834 he was appointed professor of philosophy at Halle, where he resided till his death. Among his works are to be mentioned: *Geschichte der hellenischen Dichtkunst* (1835); *Ueber Shakespeares dramatische Kunst* (1839; Eng. trans., 1864); *Ueber Princip und Methode der Hegelschen Philosophie* (1841); *Das Grundprincip der Philosophie* (1845–46); *System der Logik* (1852); *Gott und die Natur* (1862); *Gott und der Mensch* (1866–72). He was an opponent of the Hegelian philosophy, and endeavored to establish an empirical idealism.

UL'STER. The northernmost province of Ireland, comprising the nine counties of Antrim, Armagh, Cavan, Donegal, Down, Fermanagh, Londonderry, Monaghan, and Tyrone (qq.v.). Total area, 8613 square miles. Pop., 1861, 2,389,263; 1901, 1,582,826; 1911, 1,581,696. The Presbyterians and Episcopalians constitute more than half of the inhabitants.

UL'STERITES. See Party Names.

UL'STER KING-AT-ARMS. The chief heraldic officer of Ireland. See King-at-Arms.

ULTIMA THULE, ŭl'tĭ-mȧ thū'lē. See Thule.

UL'TRAMARINE' (from Lat. *ultra*, beyond + *marinus*, marine, from *mare*, sea). A blue pigment originally obtained from the mineral lazulite, or lapis lazuli (q.v.). The finest specimens of lazulite come from various localities in Persia, Siberia, and Chile, and when ground form the pigment; but, as only a very small proportion of that mineral is available, the pigment is very expensive. In 1828 Guimet, of Toulouse, was successful in producing it on a commercial scale, and almost simultaneously a synthetical method for its preparation was announced by Gmelin, of Tübingen. For the manufacture of artificial ultramarine, sodium sulphate, china clay, and carbon are ground together and heated in crucibles, afterward being roasted with powdered sulphur. A so-called direct method, which is said to yield better results, consists in calcining in a muffle furnace a mixture of sulphur, china clay, soda ash, charcoal, and some infusorial earth. The pigment finds extensive use in the arts as a coloring material, owing to its brilliancy as a body color and high coloring power. *Cobalt ultramarine*, or Thénard's blue, is a pigment prepared by mixing freshly precipitated alumina with cobalt arsenate or phosphate, drying the mixture, and then slowly heating it to redness. Yellow ultramarine is a pigment consisting of barium chromate. Laundry blueing was formerly made from ultramarine.

ULTRA-MICROSCOPE. See Microscope.

UL'TRAMON'TANISTS (from Lat. *ultra*, beyond + *montanus*, mountainous, relating to a mountain, from *mons*, mountain; from the geographical position of Italy relative to countries north of the Alps, and hence applied to the Italian party in the Roman Catholic church). The name applied to those who recognize the papal claim of supremacy over all national churches and sovereigns. Since 1870 it has been used also as a designation of all who accept the decrees of the Vatican Council, and in a broader sense it has been applied to the most conservative element in the Roman Catholic church. In a purely political sense it has come to be used to designate the extreme Catholic party in almost every nation of northern Europe. The Ultramontanists as a church party first appeared in the papacy of Gregory VII (q.v.), who maintained that the Pope had the power to depose and absolve temporal rulers. The enforcement of this theory would have had the effect of entirely superseding the freedom of action of the various churches, and its assertion aroused powerful opposition in the churches of Germany and France. After the Council of Constance (1414–18) (q.v.) the struggle between the Ultramontanists and the champions of the liberties of the various churches became the principal point of dispute within the ecclesiastical body. The opposition in the Gallican church was particularly active. After the reconstruction of Europe, following the Napoleonic wars, the actual influence of the Ultramontanists was decreased, although their principles were still often reasserted. In 1869–70, in connection with the meeting of the Vatican Council and the discussion of the doctrine of papal infallibility, the political aspects of Ultramontanism assumed new importance. In Germany, Austria, and France the Catholic parties in Parliament are designated by the name of Ultramontanes. Consult Hoenbroech, *Der Ultramontanismus* (2d ed., Berlin, 1898), and L. K. Götz, *Der Ultramontanismus als Weltanschauung* (Bonn, 1905).

ULTRA-VIOLET RAY (Method of Water Purification). See Water Purification.

ULTRA VIRES, ŭl′trȧ vī′rēz (Lat., beyond one's powers). A legal term employed to indicate the acts of, or contracts entered into by, corporate bodies beyond the scope of the powers given to them expressly or by implication by their charters or the general law under which they were created.

Ultra-Vires Contracts. *Ultra-vires* contracts of corporations should be distinguished from those which are illegal either by statute or some rule of the common law. Strictly an *ultra-vires* contract of a corporation is without legal validity to bind the corporation because the act is without or beyond the legal powers of the corporation, that is, the powers specified in its charter or certificate of incorporation, and those necessarily to be implied therefrom, and therefore has no legal existence. Illegal contracts, on the other hand, are without such validity because of the positive prohibition of such contracts by the statute or common law on grounds of public policy. This distinction is important because of the difference in the consequences which flow respectively from *ultra-vires* contracts and illegal contracts of corporations. (For a fuller discussion of this subject, see Quasi Contracts.) It is held by the English courts, by the Federal courts of the United States, and by the courts of some of the States that neither party to an *ultra-vires* contract can acquire any true contract rights under it. In each of these courts, except the English courts, it is also held that in case either party has given his performance under such a contract, he may recover the property or thing so given in an appropriate action, or the value of the performance so given, on theory of quasi contract. The distinction between rights on the contract and in quasi contract in case of *ultra-vires* contracts is often of the greatest importance.

The second view with reference to *ultra-vires* contracts, and the one which is held in most of the States, is that so long as such contracts remain executory neither party to the contract acquires any rights under it, it being a complete answer to an action brought by either party either for damages or specific performance that the contract is invalid because *ultra vires*. If, however, either party has performed the contract on his part, the other is held to be estopped to deny its validity, and the plaintiff may recover as though the contract were originally valid. In a few States, notably New York, even although the contract is fully performed there can be no recovery unless the performance has benefited the corporation. The application of the doctrine of estoppel to such cases is anomalous and in many cases practically does away with the doctrine of *ultra vires*. In the case of negotiable paper issued *ultra vires* by a corporation, it is everywhere held that *ultra vires* is a personal and not a real defense (see Negotiable Instruments), and cannot be set up against a bona fide purchaser for value, although it may be a valid defense against the original taker or holder of the paper. In determining what contracts are *ultra vires*, the courts have applied liberal rules of interpretation, holding not only that contracts expressly authorized were within the powers of the corporation, but that it has all the power to contract which can fairly be implied from the language of its charter and from the character of the business which it is authorized to conduct.

Torts and Crime. Strictly all torts committed by the agents of a corporation while acting for the corporation are *ultra vires*, since a corporation has no express or implied authority to commit tortious acts. Following this course of reasoning, the early tendency of the courts was to hold that corporations could not be held legally responsible for torts. Governed, however, by considerations of policy, courts now generally hold that corporations are liable for all torts of their agents and employees committed by them within the scope of their authority. When malice is an essential element in the tort, the malice of the agent is imputed to the corporate principal. Upon similar principles corporations have generally been held responsible for minor criminal offenses, and in many States there are now special statutes governing the criminal responsibility of corporations. It has even been said that a corporation may be guilty of a crime involving specific intent. See Criminal Law.

Courts of equity will take jurisdiction to restrain *ultra-vires* acts at the suit of a stockholder upon his showing that the directors or trustees of the corporation refuse to act. There is also statutory authority in some States for proceedings brought in behalf of the State by the Attorney-General to restrain *ultra-vires* acts when they are working a public injury, and at common law the State may proceed on the relation of a private individual to compel forfeiture of the charter of a corporation by *quo warranto* (q.v.) on the ground that the corporation is committing *ultra-vires* acts under such circumstances as to amount to a departure from the business or purposes for which it was organized. Consult the authorities referred to under Corporation; Criminal Law; Equity; Quasi Contract.

ULUA, ōōl′wȧ, **WOOLWA,** wōōl′wȧ, or Sumo. A group of tribes including the Sumo proper, the Cookra, the Poya, and others, occupying the headwaters of the streams which empty along the east coast of Nicaragua. They call themselves Sumo, the other names having probably been bestowed by their enemies, the Mosquito (q.v.). They are below middle stature, of light brown complexion and handsome features, with chests and arms strongly developed. They live in huts consisting of palm-leaf roofs raised upon posts, accommodating four families. The women wear only a short skirt of bark fibre. Painting is common, and they also flatten the head. They plant corn, cacao, sugar cane, and chile, and the women are potters, while the men are expert boatmen and lumberers. Polygamy prevails, and girls are frequently betrothed almost in infancy. Boys are subjected to manhood ordeals. Their dead are buried under sheds, and they unwind a long thread from the former owner's house to the grave. Recent investigations by Dr. Lehmann have shown that the language of the Ulua or Sumo group of tribes is recently connected with that of the Mosquito tribes of the coast and the Matagalpa of the interior.

ULUGH-BEG, ōō′lụg-bĕg′ *or* -bā′ (1394–1449). A Persian prince and astronomer, the grandson of Timur (q.v.). He succeeded, in 1447, to the Imperial throne of Samarkand on his father's death. He was a successful warrior, but was finally defeated, captured, and put to death by his eldest son, who had been driven to rebellion by his father's unjust suspicions of his loyalty.

Ulugh-Beg founded the observatory at Samarkand. He is noted as a patron of astronomers, and was himself a diligent observer. His principal contribution to astronomical science is his star catalogue, the first original one since that made by Ptolemy. The astronomical works of Ulugh-Beg were written in Arabic, afterward translated into Persian, and thence the chronological portion of them into Latin by Greaves (London, 1650), and the geographical part (1652). An independent version in Latin and Persian was published by Hyde (Oxford, 1665). The latest edition of the star catalogue was edited by Baily in 1843, and published in the *Memoirs of the Royal Astronomical Society*, vol. xiii (London, 1843).

UL′VA. A marine genus of the green algæ (Chlorophyceæ) (q.v.), known as sea lettuce, the flat membranous body resembling a leaf in appearance but not in structure.

UL′VERSTON. A seaport in Lancashire, England, 22 miles northwest of Lancaster (Map: England, C 2). Its parish church dates from 1111. It stands in an extensive agricultural and mining district, and has manufactures of iron, boilers, linen, paper, ropes, hardware, and chemicals. Pop., 1901, 10,064; 1911, 9552.

ULYSSES, ū-lĭs′ēz (Lat. *Ulysses, Ulixes, Olixes*, Athen., Bœot., Corinth. Gk. 'Ολυσσεύς, *Olysseus*, 'Ολυττεύς, *Olytteus*, general Gk. 'Οδυσσεύς, *Odysseus*, probably of Illyrian origin, influenced by popular connection with ὀδύσσεσθαι, *odyssesthai*, to be hated). A legendary Greek hero. According to the oldest legend, the Homeric, he was the son of Laërtes (q.v.), Prince of Ithaca, and of Anticleia, daughter of Autolycus. According to a later account, his father was the crafty Sisyphus (q.v.), whence he is sometimes called, by way of reproach, Sisyphides. He married Penelope (q.v.), by whom he became the father of Telemachus (q.v.). When the expedition against Troy (q.v.) was resolved on, Agamemnon and Menelaus prevailed on Ulysses, though with difficulty, to take part in it. Later traditions represent him as feigning madness—an artifice which failed through the skill of Palamedes. Once enlisted, Ulysses devoted himself to the success of the expedition; with Nestor's aid he secured the help of Achilles, and with Menelaus he undertook a fruitless embassy to Troy to demand the return of Helen and her treasures. When the Greek fleet assembled at Aulis, Ulysses brought 12 ships. In the narrative of the *Iliad* Ulysses plays an important part. In prudence and ingenuity of resource he is the foremost of the Hellenic chiefs, while in courage he is inferior to none. His later trait of trickery is seen in the episode of Dolon, but in the Homeric poems he is generally represented as a model of the older, as Achilles is of the younger, hero. After the fall of Troy, the Homeric narrative of his long wandering on his return to Ithaca is contained in the *Odyssey*. His ships were driven by a storm on the coast of Thrace, where he plundered the land of the Cicones, but lost a number of his crew. When he reëmbarked, a north wind blew his vessels to the country of the Lotophagi (the Lotus-eaters), on the coasts of Libya, where some of the companions of Ulysses ate of the wondrous fruit, and wished to rest forever. But their leader compelled them to leave the land, and, sailing north again, they touched at the Island of Goats, where Ulysses left all his ships but one. Thence he proceeded to the land of the Cyclopes, where occurred the adventure in the cave of Polyphemus (q.v.). With his reunited fleet he now visited the island of Æolus, ruler of the winds, who gave him a favoring breeze, and the unfavorable winds tied in a skin. This his companions, in search of treasure, opened, and at once they were swept back to the island, from which they were now sternly excluded. They then reached the land of the Læstrygonians, a race of cannibals, who destroyed all the ships but one. Escaping with his solitary ship, he next landed on the island of Ææa, inhabited by the sorceress Circe (q.v.). After a year's sojourn he was sent by Circe to the Kingdom of Hades, to inquire about his return from the seer Tiresias (q.v.). Tiresias disclosed to Ulysses the fact of the implacable enmity of Poseidon, whose son, Polyphemus, he had blinded, but encouraged him at the same time with the assurance that he would yet reach Ithaca in safety, if he would not meddle with the herds of Helios (the sun god) in Thrinacia.

Ulysses next passed in safety the perilous island of the Sirens (q.v.), but, when he sailed between Scylla and Charybdis, Scylla devoured six of his companions. He next came to Thrinacia, where his crew insisted on landing, and while storm bound killed, in spite of their oath, some of the cattle of Helios while Ulysses was asleep. When they had sailed away a fierce storm arose, and Zeus sent forth a flash of lightning that destroyed the ship. Every one on board was drowned except Ulysses, who, clinging to the mast, was finally washed ashore on the island of Ogygia, the abode of the nymph Calypso, with whom he lived for eight years. The nymph offered him immortality if he would remain, but his love for Penelope and longing for his home were too deep, and at the entreaty of his special guardian, Athena, Zeus sent Hermes to command his release. Sailing eastward in a skiff of his own building, he was seen by the implacable Poseidon, who roused against him a terrible storm, which wrecked his skiff. He barely escaped, by the aid of Leucothea, to the land of the Phæacians. Naked and worn by fatigue, he fell asleep, but was awakened by the sport of Nausicaa, daughter of the King, Alcinous, and her maidens. She received him kindly and brought him to the city. Entering the palace under Athena's protection, he was entertained by the King, who promised him safe convoy to his home. On the magic Phæacian ship he fell asleep, and was landed, with the rich presents of the Phæacians, while still unconscious.

Disguised as a beggar, he repaired to the hut of the swineherd Eumæus, where he met and revealed himself to Telemachus. The next day he was brought by Eumæus to the palace, where he was recognized by his old dog, Argus. Here he was harshly treated by the suitors of his wife, who were living riotously on his estate. After an interview with Penelope, to whom he foretold her husband's return, he was recognized by his old nurse, Eurycleia, whom he bound to silence. When the suitors all failed to string the great bow, he took it, easily strung it, and shot the arrow through a row of 12 axes, thus accomplishing the test Penelope had proposed for the suitors. Then, aided by Telemachus, Eumæus, and the neatherd Philœtius, he slew all the insolent suitors. The last book of the *Odyssey* records his recognition by his father, Laërtes, and a final reconciliation with the friends of the suitors, brought about by Athena's aid. The Homeric poems have a tradition of further wanderings to appease Poseidon, by introducing his worship among a people who knew not the sea, and finally a happy old age and painless death. Allusions show that to Ulysses was also given a prominent place in other episodes of the Trojan War, such as the battle over the body of Achilles, the invention of the device of the wooden horse, and the final sack of Troy. The other epics (see CYCLIC POETS) enlarged these episodes and added others, in which Ulysses frequently played but a mean-spirited part. This degradation of his character continued in many of the plays of the Attic tragedy, and was further developed in later writers, especially the comedians, and, of course, by the Romans, since to them, as the descendants of the Trojans, he was the archenemy of their race. His death in these narratives was usually attributed to his son by Circe, Telegonus (q.v.), who had been sent by his mother in search of his father. Landing in Ithaca, he was met in arms by Ulysses, and slew him with a spear tipped with the sting of a ray, thus fulfilling the prophecy that death should come to him from the sea. Consult the article "Odysseus," in Friedrich Lübker, *Reallexikon des klassichen Altertums* (8th ed., Leipzig, 1914).

UMȦ, ōō′mȧ. In Hindu mythology, one of the principal names of the consort of the god Siva (q.v.), also called Durga (q.v.), Devi (q.v.), Kali (q.v.), Parvati (q.v.), Bhavani, and regarded either as beneficent or malignant. The myths relating to this goddess, who is worshiped especially in Bengal, are recounted in the great epic poems and Puranas (q.v.), but the textbook of her worshipers is the *Dēvīmahātmya*, or the majesty of Devi, and a portion of the *Mārkaṇḍēya Purāṇa*. In the *Rāmāyaṇā* (q.v.) she is the daughter of the nymph Mena and of Mount Himalaya, whence her names Parvati, Haimavati, and similar ones, meaning "the mountainous" or "the mountain-born." According to the Puranas, in a former life she was Sati, the daughter of Daksha (q.v.), but it was only as Uma that she bore to Siva Ganeśa (q.v.), the god of wisdom, and Kartikeya (q.v.), the god of war. According to the *Harivanśa* (q.v.) in another life she was born as the daughter of Yaśoda, and exchanged for Vishnu (q.v.), when, in his incarnation as Krishna (q.v.), he was born as a son of Devaki. On that occasion she was killed by Kansa, and became a divine virgin, whence she was called Kanya, or Kumari, the virgin. The principal myths concerning her were her destruction of the demons Madhu, Kaitabha, and Mahisha, her defeat of the army of the demons Chanda and Munda, and her destruction of the demons Raktavija, Sumbha, and Niśumbha. In commemoration of her victory over Mahisha, a festival called the Durgapuja, or Durgotsava, is annually celebrated in Bengal, followed three weeks later by another, the Kalipuja, in honor of her destruction of Chanda and Munda. She dwells with Siva on Mount Kailasa, a peak of the Himalaya. Consult: John Muir, *Original Sanskrit Texts*, vol. iv (2d ed., London, 1873); W. J. Wilkins, *Hindu Mythology* (2d ed., ib., 1900); L. D. Barnett, *Antiquities of India* (ib., 1913). See *Pārvatī* in the Plate of HINDU DEITIES with INDIA.

UMAN, ōō-män′. A district town in the Government of Kiev, Russia, on the Umanka, 170 miles south of Kiev (Map: Russia, D 5). It has two palaces belonging to the counts Potocki. Pop., 1910, 41,678, of whom more than half were Jews.

U′MATIL′LA. A tribe of Shahaptian stock (q.v.) formerly near the junction of the Umatilla and the Columbia in northeastern Oregon, and now with the Cayuse and Wallawalla upon a reservation in the same neighborhood. Like neighboring tribes, they subsisted originally on fish, game, and berries, and did not practice agriculture. They were visited by Lewis and Clark in 1804, and about 40 years afterward by Jesuit missionaries, by whom some were converted and civilized. By a treaty of 1855 they agreed to come upon their present reservation. In 1910 they numbered 272.

UMAYYADS. See OMMIADS.

UMBA′GOG LAKE. One of the Rangeley Lakes (q.v.).

UMBȦLLA, ụm-bäl′lȧ. The capital of a district in the Pùnjab, India. See AMBALA.

UMBEL. A form of inflorescence (q.v.).

UM′BELLIF′ERÆ (Neo-Lat. nom. pl., from Lat. *umbella*, umbrella, umbel, diminutive of *umbra*, shadow, shade + *ferre*, to bear). The PARSLEY FAMILY. A large and important family of dicotyledonous herbs and a few shrubs containing about 250 genera and 2000 species generally characterized by the inflorescence, an umbel which is often compound. The mature fruit is necessary for the determination of most of the genera and many of the species. The species are widely distributed, but are not abundant in tropical regions. They generally have divided or compound, rarely simple, leaves, and usually abound in a resinous secretion, and volatile oils, on account of which many are reputed poisonous. Acridity is their general characteristic. Some are pleasantly aromatic, others have a powerful and disagreeable smell. In the roots of some, especially when enlarged by cultivation, starch and sugar are stored, so that they become useful for food. Many of the genera contain species of economic importance, the better known ones being *Daucus* (carrot), *Pastinaca* (parsnip), *Apium* (celery), *Fœniculum* (fennel), *Carum* (caraway), and *Coriandrum* (coriander). Among the more common genera of the North American flora are *Eryngium* (snakeroot), *Sanicula* (black snakeroot), *Hydrocotyle* (pennywort), *Osmorhiza* (sweet cicely), *Conium* (poison hemlock), *Cicuta* (water hemlock), *Sium* (water parsnip), *Thaspium* (meadow parsnip), *Heracleum* (cow parsnip), and *Angelica*. The name Apiaceæ is given by some botanists to the family Umbelliferæ.

UMBER (from Fr. *ombre*, from Lat. *umbra*, shadow, shade). A mineral pigment resembling ochre, but differing from true ochre (q.v.) in containing some oxide of manganese. It is soft, earthy, and of a dark-brown color. It occurs at many localities in Europe, notably in the island of Cyprus, and is also mined in Illinois, Pennsylvania, Georgia, and New York. Raw umber yields a brown paint, while burnt umber has a redder tinge. Both are stable and can be mixed with water or oil. See Paint, Mineral; Ochre.

UMBERTO, ōōm-bĕr′tō. See Humbert I.

UMBIL′ICAL CORD (from Lat. *umbilicus*, navel; connected with Gk. *ὀμφαλος*, *omphalos*, OIr. *imblin*, OHG. *nabalo*, Ger. *Nabel*, AS. *nafela*, Eng. *navel*), or Navel String. The bond of communication between the fœtus (which it enters at the umbilicus, or navel) and the placenta, which is attached to the inner surface of the maternal womb. It consists of the umbilical vein lying in the centre, and the two umbilical arteries winding from left to right round the vein. Contrary to the usual course, the vein conveys arterial blood to the fœtus, and the arteries return venous blood to the placenta. These vessels are embedded in a yellow gelatinous matter, known from its first describer (in 1659) as the jelly of Wharton. Nerve filaments have been traced into the cord; but the presence of lymphatics is doubtful. The whole is invested by a membrane (the amnion), and its ordinary length is about 20 inches. As soon as a child is born, and its respiration fairly established, the umbilical cord is tied and divided near the navel, which spontaneously closes, the fragment of cord dying away. See Foetus and Placenta.

UMBILICAL HERNIA. The term applied to the protrusion of intestine at the navel or umbilicus. It is of most frequent occurrence shortly after birth; but it is not uncommon in women who have been frequently pregnant. See Hernia.

UMBILICUS, ŭm-bĭl′ĭ-kŭs. The anatomical term for the navel.

UMBRA (ŭm′brȧ) **TREE.** See Ombu Tree.

UMBRELLA (from It. *ombrella*, umbrella, parasol, Lat. *umbra*, shade). In its origin, and still in the Far East, a sunshade or movable canopy regarded as a privilege of high rank, and used in ceremonial processions. In England and America the term has become restricted to round, folding shades, with high ribbed frame of steel or cane covered with silk or cotton, used principally for protection against rain, and equivalent to the French *parapluie* (against the rain). The small, fancy umbrellas used by women in Europe and America as sunshades bear the name "parasols" (against the sun). Similar sunshades were used by the women of ancient Greece and Rome. See Costume.

UMBRELLA BIRD. A black South American bird (*Cephalopterus penduliger*), the size of a crow, whose head is ornamented with a crest forming a covering somewhat like a parasol, composed of straight elevated feathers with white and stiff shafts terminated by black beards which project forward. The sides of the neck are naked, but long, black, glossy, metallic feathers, forming a loose pelerine hanging below the breast, spring from the throat and sides of the neck. The tail is long and slightly rounded. There are two other closely allied species. They live in deep woods, make rough stick nests, and utter cries, especially at twilight, described as "lowings." See Cotinga and Plate of Cotingas, etc.

UMBRELLA PLANT. See Cyperus.

UMBRELLA TREE. See China Tree; Magnolia.

UMBRETTE′. A peculiar heron-like bird (*Scopus umbretta*) representing alone an African family (Scopidæ) closely related to the shoebill (*Balæniceps*). It is a native of the wooded regions of Madagascar and most of Africa. It has a body about the size of a common fowl's, long naked legs, with very large, slightly webbed toes, and a large head with a long, keeled, storklike beak, surmounted by a great crest, suggesting in profile the name "hammerhead" given by many English observers. The plumage is purplish brown, with black tail bars; and its smoky tints make it almost invisible at dusk. At night, according to Evans, it roosts in trees. Its food consists of fish, reptiles, frogs, worms, mollusks, and insects from shallow water. The note is a harsh quack or weak metallic sound. The nest is an enormous structure of sticks, lined with roots, grass, rushes, or clay, having a hole at the side; it is placed in a tree, on a ledge, or rarely on the ground. Three to five white eggs form the complement.

UM′BRIA. In ancient geography, a country of central Italy, corresponding loosely with the modern territorial division of the same name, which constitutes the Province of Perugia (Map: Italy, D 3). At an early date the name Umbria was applied indefinitely to a large territory in central and north Italy. The Umbrians were among the oldest and most powerful nations of Italy, and probably once held all the land in central Italy between the Adriatic and the Tyrrhenian Sea. This territory was gradually decreased by the encroachment of the Etruscans on the west, of the various Celtic tribes on the north, and of the Picentes on the south, until the Umbrians were shut off from the sea in the valleys east of the Apennines.

Umbria at the period of the Roman conquest of Italy was bounded on the north by the *Ager Gallicus*, on the east by Picenum, on the south by the country of the Sabines, and on the west by Etruria. The historical prominence of the Umbrians ends with the beginning of the third century B.C.; they were defeated by Rome in 308 B.C., and, with the other confederated peoples, were crushed at the battle of Sentinum, 295 B.C. After 220 B.C. the Via Flaminia ran through the country. Umbria, together with the *Ager Gallicus*, which had been restored to the territory after the conquest of the Senones by the Romans, constituted the sixth region of Italy in Augustus' division. Knowledge of the Umbrian civilization and language has been gained chiefly from inscriptions, as the accounts left by ancient writers are of uncertain value. The most important of these epigraphical remains are the seven bronze tablets found at Gubbio (the ancient *Iguvium*, the mediæval *Eugubium*) in 1444. See EUGUBINE TABLES; also, for the language, ITALIC LANGUAGES, *Umbrian*.

The district known in modern times as Umbria was a part of the Papal States until 1860. The Province of Perugia has an area of 3748 square miles. Pop., 1901, 675,352; 1911, 686,596. The surface is mountainous, but the valleys are fertile. Capital, Perugia (q.v.). See also LATIN LANGUAGE.

UM'BRIAN SCHOOL OF PAINTING. The name applied to the Central Italian painters of the Renaissance, living chiefly within the modern Province of Umbria. The Umbrian school is characterized by its intense but dreamy religious sentiment, evident in the ecstatic expression of the faces. The Umbrians had admirable illustrative qualities and good color, but they were deficient in form and dramatic action. Though usually classed as Umbrians, the principal painters of the northern part of this territory had strong affiliations with the Florentines and differed from the others in depicting form and movement. Such artists were Piero della Francesca (died 1492), and his pupils, Mélozzo da Forli and Luca Signorelli. Gentile da Fabriano (died 1427) may be considered the first great Umbrian painter. Fra Angelico's pupil Benozzo Gozzoli (died 1497) exercised a strong influence on the Umbrian school. Its founder in the narrower sense was Niccolò da Foligno, and the first important Perugian master was Bonfigli; then in the later fifteenth century came Fiorenzo di Lorenzo, Pinturicchio, and Perugino, its best-known master next to his pupil Raphael. All the best qualities of the school culminated in Raphael, who added the best that Florence and the antique could give. A characteristically Umbrian contemporary of Raphael was "Lo Spagna" at Spoleto. Consult: Bernhard Berenson, *Central Italian Painters of the Renaissance* (New York, 1897); the monographs by Jules Destrec (Brussels, 1900); Umberto Gnoli (Bergamo, 1908); Emil Jacobson (Strassburg, 1914); and the works cited under FLORENTINE SCHOOL OF PAINTING.

UMBRIEL, ŭm'brĭ-ĕl. See URANUS.

UM'BRINE. A fish. See MEAGRE.

UMLAUFT, ụm'louft, FRIEDRICH (1844–). An Austrian geographer and author, born and educated in Vienna, where he became professor at the state Gymnasium of Mariahilf and at the municipal Teachers' College in 1870. He wrote: *Die österreichisch-ungarische Monarchie* (3d ed., 1897); *Die Alpen, Handbuch der gesammten Alpenkunde* (1887; Eng. trans., 1889); *Das Luftmeer, Grundzüge der Meteorologie und Klimatologie* (1891; Swed. trans., 1897); *Namenbuch der Stadt Wien* (1895, 1905); and edited *Die Länder Oesterreich-Ungarns in Wort und Bild* (15 vols., 1880–89). From 1882 to 1910 he was editor of the *Deutsche Rundschau für Geographie und Statistik*.

UMLAUT, o͞om'lout (Ger., sound-change). In comparative philology, the change undergone by a vowel or diphthong through the influence of a following vowel. It is, therefore, essentially a process of regressive vowel assimilation. Another form of umlaut, or process of progressive vowel assimilation, is contained in the so-called law of vowel harmony of the Ural-Altaic languages (q.v.). It occurs frequently throughout the Indo-Germanic linguistic group, although it is a characteristic only of the Germanic languages. As more or less sporadic examples of umlaut, occasionally called mutation, or metaphony, by English writers, may be cited Av. *vohu*, good, *mošu*, soon, but Skt. *vasu*, *makṣu*; Armen. *keam*, I live, but Skt. *jīvāmi*; Bœot. Gk. *τρέπεδδα*, table, but Attic *τράπεζα*; Attic Gk. *ἥμυσυς*, half, beside *ἥμισυς*; Lat. *nihil*, nothing, from *ne hilum*, not a thing; Vulgar Lat. *vixillum*, banner, *butumen*, pitch, but Lat. *vexillum*, *bitumen*; OIr. *cloth*, famous, but Gk. *κλυτός*; OChurch Slav. *bĭdrĭnŭ*, watchful, beside *bŭdrĭnŭ*, *bŭdrŭ*, Lith. *budrù*. In Germanic umlaut is caused either by *i* or *u*. The *i* umlaut changes a preceding *e* to *i*, and *a* to *e*, as Goth., OHG. *ist*, is, but Gk. *ἐστί*; OHG. *gesti*, plural of *gast*, host. In MHG. the *i* umlaut changes *o*, *u*, *ā*, *ō*, *ū*, and *uo* to *ö*, *ü*, *ae*, *oe*, *iu*, and *üe* respectively, as *löcher*, plural of *loch*, hole; *süne*, plural of *sun*, son; *gaeben*, subjunctive of *gāben*, gave; *hoeren*, present of *hōrte*, heard; *briute*, plural of *brūt*, bride; *güete*, goodness, from *guot*, good. The chief *i* umlauts in Anglo-Saxon are of *æ*, *ā*, *o*, *ō*, *u*, and *ū* to *e*, *æ*, *e* (or usually *y*), *ē*, and *y* respectively, as AS. *weccan*, to wake, Goth. *wakjan*; *hælan*, to heal, from *hāl*, health; *exen*, plural of *oxa*, ox, and *gylden*, golden, from *gold*, gold; *dēman*, to judge, from *dōm*, judgment; *wyllen*, woolen, from *wulle*, wool; *cyþan*, to proclaim, from *cūþ*, famous. In Icelandic also the *i* umlaut plays an important part. In the Teutonic languages, umlaut is found in Anglo-Saxon as early as the sixth century, and is fully developed in Low German by the eighth century. From the tenth century onward it makes its appearance also in the dialects of Middle and Upper Germany.

The *u* umlaut is less far-reaching than the palatalization caused by *i*. It does not seem to have occurred in Gothic or in High German. It is found, however, in Anglo-Saxon and, highly developed, in Icelandic. In Anglo-Saxon *a* before *u* or *o* becomes *ea*, *e* becomes *eo*, and *i* becomes *io*, although these umlauts are by no means regular in their action. Examples are *ealu*, ale, but genitive *alo*, *ealo*, Northumb. *ales*; *weorod*, folk, beside *werod*; *mioluc*, milk, but Goth. *miluks*. The principal Icelandic *u* umlauts are of *a* to *o*, *ā* to *ō*, *e* to *ö*, *ē* to *ȫ*, *i* to *y*, *ī* to *y*, *æi* to *öy* or *ey*, *ia* to *io*, *ua* to *uo* or *o*, *uā* to *ō*, *ui* to *y*, *uī* to *ȳ*, and *uæ* to *ö*. There are other minor umlauts. Anglo-Saxon has a palatal umlaut which changes the *eo* and *io*, arising from the breaking of Germanic *e* and *i* before a guttural *h* plus a consonant, to *ie* and later to *i*, *y*, and before palatals *ea* and *ēa* later became e, ē. Examples are *rieht*, *ryht*, right, beside *reoht*, OHG. *reht*; *Wiht*, Wight, beside *Wioht*; *sex*, knife, beside earlier *seax*; *ēge*, eye, beside earlier *ēage*. In Icelandic there are traces of an R umlaut, as in *ær*, they (feminine), but OSwed. *þaR*, Goth. *þōs*. In German umlaut survives as an important element in the inflection. It is found especially in nouns, as *Brüder*, plural of *Bruder*, brother (but OHG. *bruoder* for both numbers); *Söhne*, plural of *Sohn*, son (OHG. *suni*, *sun*); *Hände*, plural of *Hand*, hand (OHG. *henti*, *hant*); *Lämmer*, plural of *Lamm*, lamb (OHG. *lembir*, *lamb*). It also characterizes the comparative and superlative degrees of adjectives, as *jung*, young, *jünger*, *jüngst* (OHG. *jung*, *jungiro*, *jungisto*), and is seen in the imperfect subjunctive of certain verbs, as *hätte* from *haben*, to have (OHG. *habēti*). In English there are only sporadic traces, as in *men*, *mice*, *feet*, as plurals of *man*, *mouse*, *foot* (AS. *men*, *mæn*, *mȳs*, *fēt*, plurals of *man*, *mūs*, *fōt*), and in causative verbs, as *set* from *sit* (AS. *settan* from *sittan*, Goth. *satjan* from *sitan*, pret. *sat*). Consult: Victor Henry, *Short Comparative Grammar of English and German* (London, 1894); W. Wilmanns, *Deutsche Grammatik* (3 vols., Strassburg 1893–1906; vol. i, 2d ed., 1897); H. Lichtenberger, *Histoire de la langue allemande* (Paris, 1895). See ENGLISH LANGUAGE; GERMAN LANGUAGE; TEUTONIC LANGUAGES; and special titles devoted to the different languages mentioned in this article.

UMMERAPOORA, See AMARAPURA.

UMPQUA, ŭmp′kwạ. An Athapascan tribe.

UMRIT′SAR. A city of the Punjab, India. See AMRITSAR.

UNA, ū′nȧ. The principal female personage in the first book of Spenser's *Faerie Queene*. She stands in the allegory for Truth. She is the companion of the Red Cross Knight (q.v.) on his mission from the court of Gloriana, but is soon separated from him by Archimago and undergoes many painful adventures until rescued by Prince Arthur and restored to her knight.

U′NAKA MOUNTAINS (called also, in whole or in part, the SMOKY or GREAT SMOKY MOUNTAINS). A southwestern division of the Appalachian Mountains, branching from the Blue Ridge in south Virginia, and extending southwestward near the Tennessee and North Carolina boundary, penetrating a short distance into north Georgia (Map: North Carolina, A 4). On the west they are separated from the Cumberland plateau by the great eastern valley of the Tennessee, and on the east they are connected with the Blue Ridge by an intricate system of cross ranges forming the rugged remnants of a lofty plateau culminating in the Black Mountains. Nearly all the eastern headstreams of the Tennessee rise on this inclosed plateau and break through the Unaka Range. Otherwise the latter forms a sharply defined ridge between Tennessee and North Carolina. In the north there are three main ridges inclosing fine valleys. The average elevation of the main ridge is from 3000 to 5000 feet, the middle portion, generally known as the Great Smoky Mountains, being the highest. Here a number of peaks rise to 6000 feet, extending their rocky summits above the timber line. The highest is Clingman Peak (Yancey Co., N. C.) with an altitude of 6611 feet. The range is composed chiefly of Lower Silurian sandstones and shales, with some Archean metamorphic rocks. The slopes are covered with pine forests, and the range abounds in grand and rugged scenery.

UNALASKA, ōō′nä-läs′kȧ, or **UNALASHKA.** The second largest and most important of the Aleutian Islands, 135 miles southwest of the extremity of the Alaska Peninsula (Map: Alaska, E 9). It is about 75 miles long and from 10 to 25 miles wide; its coasts are indented with fiords, and it consists mainly of barren and treeless mountains, among which rises the volcano of Makushin to a height of 5691 feet. The island is thinly populated by Aleuts and a few Russians and Americans, chiefly engaged in fishing and sealing. The largest inhabited place is Unalaska Village or Iliuliuk, with a population in 1915 of about 400. It has a government school of about 80 pupils. It is a port of call for vessels navigating Bering Sea.

UNALGA (ōō-näl′gȧ) **ISLAND.** An island of the Andreanof group, Alaska, situated in about 54° N., 166° W. It has a wireless station of the United States navy, and was made a lighthouse reservation in 1901.

UNAU, ū-nạ′ *or* ōō-nou′. The two-toed sloth (q.v.).

UN′CAS (?–c.1683). A famous sachem of the Mohegan (q.v.) Indians in Connecticut. At first a Pequot chief, he revolted about 1635 and collected a number of Indians, who took the name of Mohegans, which had once belonged to the Pequot (q.v.), against whom he fought as an ally of the English in the Pequot War of 1637. He was rewarded by the whites with a grant of Pequot lands. In 1643 he defeated the Narraganset chief Miantonomo (q.v.), and later, with the sanction of the commissioners representing the United Colonies of New England, had him put to death. In 1648 the Mohawks and Pocomtocks began an unsuccessful war against him. In 1657 he was besieged by the Narraganset sachem Pessacus, but, according to tradition, was relieved by Ensign Thomas Leffingwell. The date of his death is unknown, though he is known to have been alive in 1682. Consult S. G. Drake, *The Book of the Indians of North America* (Boston, 1834), and W. L. Stone, *Uncas and Miantonomoh, a Historical Discourse* (New York, 1842).

UNCIAL (ŭn′shĭ-*a*l) **LETTERS.** A term applied in Greek and Latin paleography to a modification of capital letters, which are made rounded instead of square, as being written on papyrus or vellum. See PALEOGRAPHY, *Letters and their Forms*.

UN′CINA′RIA. See ANKYLOSOMIASIS; HOOKWORM DISEASE.

UNCLEANNESS. As used in the Old Testament, a term having several shades of meaning. In its primary sense it signifies a bodily condition which during its continuance excluded from the holy community. Such a condition might be produced by a variety of causes, as childbirth (Lev. xii), contact with a dead body (Num. xix. 11–12), or leprosy (Lev. xiii–xiv). Various purificatory rites are prescribed in the Pentateuchal codes to free from this condition. In a wider sense the term "unclean" is applied to animals prohibited as food (Lev. xi; Deut. xiv. 3–21), and the fruit of trees was unclean (i.e., could not be eaten) for the first three years (Lev. xix. 23). Certain bodily functions (connected with reproduction) were generally regarded in early times as rendering a person unfit to perform religious rites, or, in other words, to approach the deity.

The stipulations in regard to certain animals regarded as unclean belong in a different category. In many regions certain animals are considered sacred either because a clan regards itself as descended from a particular animal or because for other reasons the animal in question is supposed to afford protection to the clan. Thus the animal formerly regarded as sacred comes to be avoided as unclean. And connection with the widespread symbolism of giving to deities the shapes of animals leads to the conception that certain animals are to be avoided because of their demoniac nature. In the Pentateuchal regulations all these factors may be traced—the sanctity attached to certain animals, their position as totems, as well as the later conception which regarded them as the abode of evil spirits.

In primitive religions disease is ascribed to the presence of a demon or evil spirit in the body, brought there by the power of a sorcerer or witch. A cure is thought to be effected by certain rites in which sympathetic magic plays a prominent part. In the Pentateuchal codes, however, an advance in religious ideas is manifested by designating a diseased person as one smitten by God. The disease chiefly dealt with is a form of leprosy, which is still common in the East. From disease to death is but a short step, and the primitive views held in regard to death led to precautions to be exercised by those who are obliged to touch a dead body. On the one hand, death itself indicates the triumph of the evil spirit, while on the other, the uncertainty as to the whereabouts of the soul or spirit of the dead person incites fear and leads to precautions against the unexpected return of the spirit perhaps only temporarily absent. By a natural extension of the term the dead person is regarded as unclean.

The rabbinical schools in Babylonia and Palestine elaborated the subject still further, and in the Talmud the laws and degrees of the various kinds of uncleanness are set forth in great detail accompanied with minute discussions of casuistical problems in connection with the subject. The extension of the term "unclean" to the fruits of trees for the first three years is quite secondary, and dates from the late period when it had acquired the general sense of forbidden, without reference to any genuine uncleanness connected with the transgression involved. The prohibition appears to have been an economic regulation to insure productiveness. Consult the commentaries on the passages cited: B. Stade, *Geschichte des Volkes Israel*, vol. i (Berlin, 1887); I. Benzinger, *Hebräische Archäologie* (2d ed., Tübingen, 1907).

UNCLE SAM. See National Nicknames.

UNCLE TOM'S CABIN. See Stowe, Harriet Beecher.

UNCOMMERCIAL TRAVELLER, The. A series of papers written by Charles Dickens for *All the Year Round*, from Jan. 28 to Oct. 13, 1860. Eleven new sketches were added in the edition of 1868 and seven in 1869.

UNCONFORMITY. A term applied in geology to a break or interruption in the sequence of rock formations. In areas of stratified rocks one series may be found sometimes to rest upon the upturned or eroded edges of another series, thus showing that the deposition of the inferior beds was followed by an upheaval, during which they were disturbed from their horizontal position or were eroded, and then by a depression beneath the water, where the upper series was deposited. An unconformity, therefore, marks a hiatus in the geological record—a lapse of time unrecorded by sedimentation—and it is only by examining the sequence of deposits in other regions that the missing series can be supplied. See Geology.

UNCONSCIOUS, The. An hypothesis of the school of psychology of Dr. S. Freud (q.v.), used originally to explain and cure various types of maladies of mental origin. (See Psychotherapy.) This doctrine of the unconscious, which is radically different from the conception of the older psychology given under subconscious (q.v.), was first published in 1893. It is also essentially different from the unconscious will of Schopenhauer (q.v.) or of Hartmann (q.v.). The conscious life of man, varying in intensity from the maximum clearness at the focus of attention to the marginal states (sounds, sights, etc., faintly heard and partially attended to, including ideas and imaginations), is grounded, according to the Freudian school, upon the unconscious, which never, as such, enters consciousness, but which plays an important part in the mental life by directing or conditioning the choice of ideas that shall enter consciousness.

The unconscious is an instinctive or impelling force or desire and does not reason or think in conscious modes. Its emergences into consciousness take the form of expressions of desire mostly so elemental and gross as to be unacceptable to modern social life. So there is assumed a transforming and distorting agency that stands at the threshold of consciousness and rehabilitates or disguises the expressions of desire so that they shall not offend the moral sense of the conscious life. This agency Freud calls the Censor. "The unconscious idea is one which *cannot* penetrate consciousness no matter how powerful it may become; and one which we do not perceive but whose existence we concede because of other signs and proofs" (Freud) —somewhat analogous to the astronomers' inferring the existence of an invisible body from the aberrations of the planets that are visible. Beside the unconscious and standing below the conscious is the state of those mental processes which, like the multiplication table, may be called into consciousness at will. Freud has called this state the *foreconscious*. Substantial practical results, shown in the cure of mental and other diseases, have justified the assumption of the impelling force of the unconscious, which force is called the *libido* or desire.

Concrete illustrations of the effects of the unconscious in everyday normal life are everywhere observable. The forgetting of names is explained by the desire to avoid letting them come into consciousness, because unpleasant experiences associated with them might be recalled; forgetting to post a letter containing a check may be caused by unconscious desire not to let go of the money. Freud relates (in his *Interpretation of Dreams*) that although intending to visit an old and uninteresting woman he found himself before the door of a very much more attractive person, and explains his absent-minded action by the fact that his unconscious desired to visit the attractive person while his conscious interest would have led him to his aged patient. The effect of the power of the unconscious is most strikingly noticeable in its work upon the dreams of all persons. The interpretation of dreams according to psychanalysis, as Freud has termed his method, is the most important feature of the Freudian psychology. (See Dreaming; Freud, S.; Hysteria.) The unconscious is represented as being conditioned to a large degree by heredity and as a type of blind desire recapitulating the evolution of the mental life of the race. (See Recapitulation Theory.) The *libido*, or primal psychic desire, as it is ontogenetically developed, strives to satisfy itself, first with respiratory, nutritive, and eliminative activities (in the new-born infant), then with investigations into the various parts of its body (the so-called auto-erotic stage), as a concrete example of which is mentioned the thumbsucking of children, in many cases carried on for many years; then in a general magnifying of interest in the ego as a whole (the Narcissistic period), and finally at the age of puberty in normal humans, in the development of true sexual love which is transferred from self (unless retarded or obstructed) to its object in the opposite sex, the true mate. A fundamental type of the unconscious mental life which Freud believes to exist in every human he has termed the "Œdipus complex." This implies not that every man wishes to kill his father and marry his mother, a misconstruction which has caused much criticism of Freud's theories, but that in the usual life of the child his first object of affection is obviously his mother and he instinctively regards his father as his rival. The manner in which any given individual has unconsciously worked out the relations of this Œdipus complex is looked upon as a measure of his progress towards a truly adult social life. Most psychoneurotics and many apparently normal persons are shown, by the latent content of their dreams, to have been unsuccessful in the practical working out of this Œdipus complex in a way which will enable them to perform to the utmost of their abilities their work in human society. Of this maladaptation to the requirements of life one is painfully aware when he has suffered in some way by the lack of harmony, the conflict in his psyche, as it is called. His unconscious having been analyzed by the method of psychanalysis, the realization of the maladjustment to environment leads the individual to a conscious endeavor towards a reform which is essentially ethical; and it is believed by the Freudians that the harmony with the ideals of civilization thus attained is the cause of the amelioration or cure of the malady.

The effect of the unconscious is seen by the Freudians not only in the individual but in the race, being shown in all works of imagination, all religious and social movements, such as alchemy, Rosicrucianism, Freemasonry, etc., and in poems and other works of art and in myths. An extensive study has been made in the subject of myth formation as governed by unconscious psychic processes, and a similarity noted between myths and dreams. One author (Abraham) calls the myth the dream of the nation and the dream the myth of the individual.

The details of the Freudian view of the unconscious are admittedly only a working hypothesis, and as such, like every scientific theory, are subject to constant development at the hands of scientists, among whom are a large number of psychiatrists in Europe and America. The conflict between this theory and the regular academic experimental psychology is more apparent than real, as the Freudians do not wish to say that there is such a thing as unconscious conscious states, an implication that will naturally be attributed to them. They merely posit a force, imperceptible as such, but the effects of which, seen in the various phenomena of hypnotism, etc., are not explainable on any hitherto appearing hypothesis. The effects of this force have, however, quite practical results in human conduct, and are quite workable for the understanding of psychic manifestations and for the conscious evolution of psychic life. Consult: S. Freud, *Interpretation of Dreams* (New York, 1913); O. Pfister, *Die Psychanalytische Methode* (Leipzig, 1913); H. Silberer, *Probleme der Mystik und ihrer Symbolik* (Vienna, 1914); Morton Prince, *The Unconscious* (New York, 1914); C. G. Jung, *Psychology of the Unconscious* (ib., 1916).

UNCONSCIOUS CEREBRATION. See Cerebration, Unconscious; Determining Tendency; Subconscious.

UNCTION (Lat. *unctio*, an anointing, from *unguere*, to anoint). The practice of anointing the body, or certain portions of the body, with oil. It was resorted to by the ancients from motives of health, of athletic development, or of luxury; but the practice now is chiefly a religious one. It was a rite in frequent use among the Egyptians, as well as the Greeks and Romans. Among the Hebrews priests and kings were anointed upon being set apart for their several offices, as were also sacred vessels. In Christian use, anointing in sickness was common from a very early time. (See Extreme Unction.) Besides the anointing of the sick, however, there were many other sacred unctions in ancient Christian practice; viz., in baptism, confirmation, ordination, consecration of churches, and the coronation of kings.

UNDERGROUND RAILROAD. The name popularly applied before the Civil War to the system of aiding fugitive slaves to escape from their masters and elude pursuit. By furnishing food and shelter as well as advice to fugitives, northern abolitionists enabled thousands to escape to Canada beyond the reach of the Fugitive Slave Law. The most favored routes lay through Ohio and Pennsylvania. Houses along them came to be known as stations; those who directly assisted the escaping fugitives were known as conductors; and those who made contributions of money, clothing, etc., were known as stockholders in the enterprise. Many negroes in Canada made trips to the South to assist their friends in escaping from slavery. Rewards were offered by Southern legislatures and individuals for the delivery of such persons south of Mason and Dixon's line. Among the most active white persons in the underground-railway service were Levi Coffin, Josiah Grinnell, Gerrit Smith, Theodore Parker, Thomas Garrett, Rev. Charles Torrey, and Samuel J. May. Coffin was commonly styled the president of the concern, and he claimed to have been actively engaged in the business for 33 years and to have received into his house an average of 100 fugitives annually. The historian Rhodes observes that the chief historical importance of the Underground Railroad lay in its manifestation of popular sentiment. Many of those concerned in this service were fined heavily for violating the Fugitive Slave Law, Garrett alone paying a fine of $8000; but occasional punishments inflicted did not break up the practice, and it continued to be one of the chief grievances of the South against the North. Consult W. H. Siebert, *The Underground Railroad from Slavery to Freedom* (New York, 1899).

UNDERGROUND RAILWAY. See Railways; Tunnel; Urban Transportation.

UN'DERHILL, John (?-1672). An American colonist, born in Warwickshire, England. In his youth he saw military service in the Low Countries and Spain, and in 1630 he accompanied the elder John Winthrop to Boston. Four years after his arrival he was elected to the Colonial Assembly, and in 1637 he aided Capt. John Mason (q.v.) to exterminate the Pequot Indians. Of this expedition he wrote an account entitled *Newes from America*, which was published in London the following year. In spite of the services thus rendered he incurred the wrath of the colonists by espousing the Antinomianism of Wheelwright and by his immorality. Leaving Massachusetts, he took refuge at Dover in New Hampshire, and was there elected Governor. Later he removed to Connecticut and became a member of the Assembly. In 1643 he entered the military service of the New Netherlands, but 10 years later he was expelled and went to Rhode Island, where he obtained a commission to make war on his late employers. In 1664 the New Netherlands were conquered by the English, and Underhill returned and settled at Oyster Bay, where in 1667 he obtained a grant of 150 acres of land from the Mantinenoc Indians. On this property, which he named Killingworth, he passed his later years.

UNDERLEASE. The creation of a new term by a lessee of lands, by alienation of a portion of or an interest in his own term, with a reversion in himself. Where a lease is silent on the question a lessee may make a valid underlease, so long as the conditions in the original lease are observed, and it is therefore customary to include in the lease a covenant against subletting or assignment by the lessee, without the consent of the landlord. See LANDLORD AND TENANT, and consult the authorities there referred to; LEASE.

UNDERSTANDING. A term which has been employed in various philosophical systems, from Plato to Hegel, as in some sort antithetical to reason. In general, the point of distinction has been that reason is the higher, understanding the lower faculty of cognition; that reason apprehends intuitively and in wholes, understanding discursively, on the ground of premises and hypotheses which it does not itself test; that reason moves above the realm of sense, while understanding is indebted for its material to the empirical data of sensation. In the modern psychological system reason and understanding have either dropped out of use or at least have come to play a very subordinate part. See KNOWLEDGE. Consult: J. Sully, *The Human Mind* (2 vols., New York, 1892); William James, *Principles of Psychology* (new ed., 2 vols., ib., 1905); W. Wundt, *Physiologische Psychologie* (6th ed., Leipzig, 1910–11).

UNDERTONES. See HARMONICS.

UNDERWING MOTH. Any noctuid moth of the subfamily Catocalinæ, and especially one of the type genus *Catocala*, of which more than 125 species inhabit the United States. Many have beautifully colored hind wings, which, however, are entirely concealed by the others when they are at rest. They are night fliers, and generally pass the day upon trunks or branches of trees which they closely resemble in coloring. The larvæ are inconspicuous, and are usually protectively colored, and curious lateral structures have been developed for the purpose of disguising the resting line between the larva and the surface upon which it stands. Some of them have developed bright warning colors in spots which may be exhibited at the will of the larva.

UN'DERWOOD, LUCIEN MARCUS (1853–1907). An American botanist, born at New Woodstock, N. Y. He graduated at Syracuse University in 1877. He was professor of botany and geology at Illinois Wesleyan (1880–83), professor of botany at Syracuse (1883–91), and De Pauw (1891–95), and in 1896 became professor of botany at Columbia. He committed suicide. He published: *Our Native Ferns and how to Study them* (1881; rev. in 1882 as *Our Native Ferns and their Allies*, 5th ed., 1900); *Descriptive Catalogue of North American Hepaticæ* (1884); *An Illustrative Century of Fungi* (1889); *Hepaticæ Americanæ* (1887–93); *Moulds, Mildews, and Mushrooms* (1889). His *Underwood Families of America* was edited by H. J. Bonker in 1913.

UNDERWOOD, OSCAR WILDER (1862–). An American legislator, born at Louisville, Ky. He was educated in law at the University of Virginia, and settled at Birmingham, Ala., being admitted to the bar in 1884. In 1892 he was made chairman of the Democratic district executive committee, and in 1894 he was elected Representative in Congress, but his seat was successfully contested by Truman H. Aldrich. He was reëlected in 1896 and served continuously until 1915. In Congress, Underwood became one of the most prominent debaters and parliamentary leaders of his party and its chief expert in tariff legislation. Although the representative of a manufacturing and mining district, he stood consistently for a revenue tariff. In 1910 he coöperated with Champ Clark as a leader of the Democrats in reducing the powers of Speaker Cannon (q.v.). In 1911 he was made chairman of the Ways and Means Committee and majority leader of the Democratic party in the House. He is supposed to have been the author of the great reform in procedure whereby committee members were to be elected by the House on nomination of the Committee on Ways and Means. Underwood led the fight for Canadian reciprocity and was the framer of the series of tariff measures revising separately various schedules of the Payne-Aldrich Law, such as the Farmers' Free List Bill, the Wool Bill, Cotton Bill, Steel Bill, and a bill changing the chemical schedule, which were vetoed by President Taft. His skill in leadership brought him wide notice, so that as a candidate for the presidential nomination at the Baltimore Convention in 1912 he ranked third, receiving at one time 130 votes. Afterward he was, in general, a supporter of President Wilson, although he opposed the repeal of the Panama Canal Tolls Exemption Act. In 1913 he was largely responsible for the important Underwood-Simmons Tariff Act (see TARIFF). In 1914 he was elected United States Senator, having defeated Richmond P. Hobson (q.v.) in the primary election by more than 20,000 votes. See UNITED STATES, *History*.

UNDERWRITER. In ordinary usage, a person who is authorized to negotiate insurance contracts. In modern financial practice a peculiar form of insurance has arisen to which the term "underwriting" is applied. It has been resorted to for many years in marketing new securities for established corporations, but has reached its highest development in the financing of the large industrial corporations recently formed. When a large corporation is organized to absorb a number of existing companies it is usually necessary to raise a large sum of money to serve as a working capital or to be employed in the purchase of stock in the original companies which holders are unwilling to exchange for new securities. To raise this cash the services of an underwriter are usually secured. The underwriting contract is one by which the company is assured of a definite amount of capital within a stated time. The underwriter binds himself to take at some stated future time a stipulated part of the securities of the new company at a price named in the contract, unless such a part is sold before that time at as high a price. He usually further agrees to advance at once the capital needed to launch the company. The underwriter leaves a wide margin between the price at which he agrees to take the stock and the price at which he hopes to sell it. A part of his reward comes from this source. He sometimes exacts in addition a bonus of stock for himself, or a commission on all stock sold, and occasionally stipulates that none of the stock given to others shall be put on the market until he has disposed of the entire amount that he has underwritten.

The securities of a corporation of any magnitude are seldom underwritten by a single person or firm. The original underwriter usually allows other bankers or favored customers to share in the underwriting. The group is known as an underwriting syndicate. The original underwriter usually acts as syndicate manager. Each member of the syndicate subscribes for a part of the stock. The cash that has to be raised to carry out the agreement with the company is secured by the syndicate manager partly through an assessment pro rata upon the members of the syndicate, partly by borrowing on the security of the underwriting. At the expiration of the time limit the syndicate manager distributes the profit of the transaction pro rata among the members, if the specified amount of stock has been sold. If some of it still remains unsold, whatever profit has been realized is distributed, and each member of the syndicate is called upon to take his proportionate share of the unsold stock at the stipulated price.

UNDERWRITING, Marine. See Ships and Shipping, *Classification for Marine Insurance.*

UNDERWRITING OF SECURITIES. See Railways.

UNDINES, ŭn-dēnz′ (ML. *undina*, from Lat. *unda*, wave). The name given in the fanciful system of the Paracelsists to the elementary spirits of the water. Paracelsus describes the Undines in his *Treatise on Elemental Spirits.* They are of the female sex. This order of elementary spirits intermarries most readily with human beings, and the Undine who bears a child by such union receives with her babe a human soul. But the man who marries her must be careful not to go on the water with her, or at least not to anger her there, for she will return to her original element. Should this happen, the Undine will seek to destroy her husband should he venture on a second marriage. Fouqué has made this Paracelsist fancy the basis of an exquisite tale entitled *Undine,* published in 1811 and frequently translated into English.

UNDUE INFLUENCE. In law, such an influence or control exercised over the mind of a testator that his will is practically overpowered, and that he is constrained by it to make some disposition of his property by will contrary to his own best judgment and wishes. Mere persuasion, appeals to the charity, benevolence, affections, gratitude, or pride of a testator will not constitute undue influence, unless carried to such an extent that the mind of the testator is virtually overpowered. For example, one of several children may suggest to one of their parents that the latter should bequeath to him a larger share of his property than to the others, and urge as a reason that he labors under some disability rendering him less able to support himself than the others, or that the others have been abundantly provided for by bequests or devises from other relatives, etc. Where a will is contested on the ground of undue influence, the courts will scrutinize very carefully the relationship which existed between the testator and the beneficiary, and if it was of a confidential or fiduciary character, as that of attorney and client, physician and patient, religious confessor and confessant, such a fact is regarded as a suspicious circumstance, which, taken in conjunction with proof of active efforts on the part of the beneficiary to induce the testator to make his will in favor of the former, may give rise to a presumption of undue influence. Ordinarily, however, where undue influence is charged, the burden of proof rests upon the party making it. Any person who would have been a legal heir if the testator had died intestate may contest his will on the ground of undue influence, and if he is successful the court will refuse to probate the will. See Will, and consult the authorities there referred to.

UN′DULANT FEVER. See Malta Fever.

UN′DULATORY THEORY OF LIGHT. See Light.

UNEARNED INCREMENT. The extent to which the value of real property increases independently of any expenditure of labor or capital upon it by its possessor. See the article Single Tax.

UNEMPLOYMENT. A term applied to that condition of industrial life in which there is a considerable number of workmen out of work. In its widest application it describes the condition of several classes. In a report by the Labor Department of the English Board of Trade in 1893 the term is used of four distinct classes: (1) those who, engagements being for short periods, have terminated their last engagement on the conclusion of a job, and have not entered on another; (2) those who belong to trades in which the volume of work fluctuates, and who, though they may obtain a full share each year of the work afforded by their industry, are not at the given time able to get employment at their trade; (3) those who are economically suffering because there is not enough work in those trades to furnish a fair amount to all who try to earn a livelihood at them; (4) those who cannot get work because they are below trade standards of efficiency, or because their personal defects debar them. Another classification divides the unemployed into three classes: (1) members of season trades; (2) members of decaying trades; (3) the "fringe" or least competent members of every trade. These are broad definitions, including two separate groups, those who for one reason or another, as feebleness, illness, old age, criminal characteristics, or mental deficiency, are incapable; and, secondly, those able and willing but unable to find work. The first class has always existed, and its presence occasions different phases of the problems of poverty and pauperism. The existence of the second class constitutes more strictly the problem of unemployment. Irregularity of employment even for competent workmen is not a modern phenomenon. It has been characteristic of every stage of economic development; but, from the growth of industrial democracy and the development of humanitarian interest, the evil assumes new importance.

The immediate causes of unemployment are many. Chief among them are: (1) fluctuations due to change of season, as in the building trades, in dock labor in London, or in the tea, wool, and timber industries; (2) introduction of new machinery and transformation of processes; (3) migration of labor from rural districts to the city, or from one country to another; (4) displacement of adult males by women or children; (5) shifting of the seat of an industry from one place to another; (6) change in fashion; (7) industrial depression or the operation of some extraordinary occurrence, as war. Some of these causes have been in operation with increasing force since the revolutionary inventions of the eighteenth century, and the introduction of new methods of transportation in the first half of the nineteenth century. The influence of the causes mentioned has been accentuated during the past century by the periodic appearance of crises which profoundly affect the entire organization of trade and industry. Under international competition markets become more sensitive to remote disturbances; production may cease, and entire classes of workmen for weeks together be thrown out of work. In addition to these clearly recognizable causes, various theories, involving a discussion of the fundamental principles of political economy, have been advanced to explain the phenomena of unemployment. Only a reference can be made to these. First, the theory of overproduction: under the present system of production, with its enormous capacity for manufacture, more goods are created than are required for market needs; consequently there must be cessation at regular intervals until the excess supply has been taken up. Second, the theory of underconsumption: the rich hoard and invest too much in fixed capital, while the poor have not the power of wholesome consumption. Third, the theory of inflated credit: the extensive organization of business, the promotion of new enterprises, the growth of banking institutions for the sale of credit have all stimulated the growth of the credit system; the settlement of contracts is thus made contingent upon future success; this development goes beyond the limits of safety, and periodically necessitates contraction; this depresses industry, and men are out of work. Fourth, the Socialist theory, which attributes unemployment to the institution of private property and the practice of individual competition: these necessarily cause a never-ending fluctuation of supply and demand, and prevent a harmony of industrial interests.

Statistics of unemployment are far from satisfactory. To determine the amount of unemployment statistics should show the number and proportion of those out of work on a particular day and also the duration of unemployment for each workman during the year. Popular estimates of unemployment are greatly exaggerated, owing to the inclusion of the shiftless and chronic paupers. A true estimation of the significance of unemployment can be secured only by a classification of statistics by cause of unemployment: whether due to seasonal fluctuations peculiar to a trade, to inability to find work in consequence of an industrial depression, to personal characteristics which place a man in the class of unemployables, or to sickness or disability. The principal sources of unemployment statistics are: returns from trade unions, statistics of men employed in manufacturing establishments at different seasons; census statistics of the unoccupied; special investigations or censuses of particular cities, or groups of workmen; records of distress committees, especially in England since 1905; records of employment bureaus; and statistics secured in connection with unemployment insurance benefits.

Trade-union returns were earliest developed, and give fairly reliable data of the amount of unemployment among their members. Returns of trade unions are published, e.g., by the Labor Department of Great Britain in the *Labor Gazette* and in the *Annual Abstract of Labor Statistics*, beginning with 1887; by the Labor Department of France since 1894, and of Belgium since 1895. German figures on unemployment are published in the *Reichsarbeitsblatt* and in the *Arbeitsmarkt*. In the United States, the Bureau of Labor of New York publishes in its quarterly bulletin returns from trade unions (since 1897), and the Massachusetts Bureau since 1905; the American Federation of Labor gives a monthly report of unemployment in the *American Federationist*. These records are limited as a rule to well-organized trades. The English trade-union returns published by the Labor Department of the Board of Trade cover 650,000 unionists, about one-third of the total members of trade unions, and one-twelfth of the total industrial manual workers. The proportion of union workmen out of work to the total membership (minus those who were sick, on strike, etc.) varied from 1894 to 1908 between 2.4 per cent and 6.9 as an average for the year. The seasonal fluctuation of some trades is clearly revealed by the figures. The percentage in the building trades (carpenters and plumbers) varied from 3.3 in August to 5.9 in December; in the furnishing trades from 7.9 in January to 2.4 in April. No definite conclusion as to unemployment among all industrial workers can be drawn from these figures; they include too great a proportion of skilled workmen, and of the skilled workmen those in the engineering and building trades are more than proportionately represented.

Statistics for unemployment are not as well developed in the United States as in Europe. Trade-union returns for selected industries in New York State indicate a percentage varying from 10 to 37 per cent for different seasons and for different years; in 1910 the lowest percentage was 12.5 in September and the highest was 24.5 in January. In 1902 for May the figure was 14 per cent; in 1903, for the same month, 20; 1904, 27.1; in 1905 it fell to less than 10; in 1910 it was 14.5 and, in 1911, 27.2. These figures are reported by the secretaries of the trade unions and cover a membership of approximately 100,000. No careful discrimination is made in these returns between those out of work because they cannot find employment—the real unemployed—and the sick, disabled, etc.; and in this respect they are much inferior to English statistics. Figures for all unions in the State, including 450,000 men, giving the number idle on the last day of the quarter show a somewhat smaller percentage of idleness than for the selected unions. Further the percentage idle throughout the quarter for all unions for July to September varied from 1.9 in 1906 to 12.8 in 1908; for the first quarter from 5.5 in 1903 to 26.3 in 1908. Returns for trade unions in Massachusetts indicate a smaller proportion of trade-union members out of work than those for New York; the extremes of variation for unemployment at the end of each quarter from 1908 to 1911 being from 17.9 to 4.8 per cent. Perhaps the higher proportion returned in New York may be due to the greater relative weight of the building and clothing trades in the New York data—industries in which unemployment and seasonal fluctuation are very considerable. The reports of the *American Federationist* indicate a low degree of unemployment. In 1908, a year of depression, the percentage varied from 4.1 to 9.6; the percentage for the preceding year varied from 0.2 to 5.8 for the different months. These figures seem more comparable to the English returns.

The statistics from manufacturers as to numbers employed in different months afford an indication of the seasonal fluctuation of unemployment. The figures for the Federal Census of 1905 showed a maximum number employed of 5,678,000 in October; the minimum, 5,263,000, fell in January; the difference indicates that 7.3 per cent fewer men were employed in January than in October. The figures do not indicate the proportion unemployed in the latter month, nor do they take into account the possibility that those not employed in manufacture in January may be able to find work in other lines.

The statistics of the Federal Census on unemployment are unsatisfactory and unreliable. In 1900, 22.3 per cent of the occupied over 10 years were returned as unoccupied for some part of the census year. About one-half of those reported idle were unoccupied for three months or less, and four-fifths of the rest were unemployed for a period of four to six months. These figures throw no light as to the cause of idleness, whether sickness, disability, whether from choice or from inability to secure work. They cover all persons 10 years of age and over who report a regular occupation, and probably include many children attending school who are employed a part of the year.

Special investigations throw more light on the subject. A special police census, e.g., was taken in Rhode Island in March, 1908, to determine the number unemployed on account of the industrial depression then prevailing. The five principal cities with about two-thirds of the wage earners of the State were canvassed: 7.8 per cent of the estimated number of wage earners in these cities were found to be unemployed, and 18,292 for the entire State. These figures were corroborated by returns from manufacturers indicating for Feb. 28, 1908, a decrease of 19,000 employed from the figure for 1907. This census did not take any account of men working on short time, and it was alleged that men employed for a few hours a day on charity work were included among the employed.

Much information on the numbers of those seeking work can be obtained from statistics of labor exchanges. Nineteen states and a number of municipalities have established labor exchanges furnishing free service in bringing employer and the seeker after work together. Statistics of these offices are not statistics of the unemployed alone; they are rather statistics of the labor market—i.e., of the offer and demand for labor, for a certain percentage of those who register have positions and file applications simply in the desire to change. Further information of a fragmentary sort can be obtained from the records of public poor departments and charitable societies, especially where a record is kept of the cause of destitution. Care must be taken to distinguish between the new applications and the total number, in order to avoid duplication. More complete data on unemployment and especially its extent will be secured by the insurance funds which have been established in England in connection with compulsory unemployment insurance of workmen in certain construction and engineering trades.

The remedies proposed for the relief of unemployed are of two kinds, those applicable in times of emergency and those which are permanent in their operation. In the administration of emergency relief difficulties are met, for it is easy to transmute unemployment into voluntary idleness. Discrimination must be shown, first, in the selection of the persons to whom relief work is to be given; second, in the choice of work to be undertaken; and, third, in the organization of the agencies by which relief work is to be administered. It is difficult to separate the worthy from the unworthy, and to prevent the influx of the unemployed from outside districts. Abuses occasioned by lax methods are well illustrated by the soup kitchens and bread carts in American cities in 1873, and by the indiscriminate distribution of the Mansion House Fund in London in 1886. Efforts were made to develop a wiser policy in the relief work of each country in 1894. It is now generally agreed that emergency funds as far as possible should be restricted to those who in ordinary times are habitually at work, to those personally known, and to those who are willing to accept less wages than customary, or to work fewer hours per day or fewer days per week, so as to prevent refusal to work elsewhere under ordinary conditions. In brief, there must be investigation and some sort of test. The principles adopted by the Local Government Board of England in 1893 in the selection of work were as follows: (1) work which does not involve the stigma of pauperism; (2) work which all can perform, whatever their previous vocations; (3) work which does not compete with that of other laborers at present in employment; and (4) work which is not likely to interfere with the resumption of regular employment in their own trade by those who seek it. In accordance with the foregoing principles, municipalities were advised to undertake spade industry on sewage farms, the laying out of open spaces, recreation grounds, and new cemeteries, the cleansing of streets not usually undertaken by local authorities, the laying out and paving of new streets, and the extension of sewerage work and works of water supply. These forms of work, however, do not meet the needs of all—the experience of cities and towns in the United States in 1894 showed that many mill hands and artisans were physically unable to endure out-of-door work in the winter or during inclement weather—and, of course, women are not provided for.

The agencies to relieve distress among the unemployed are of five classes: first, special citizens' relief committees, organized primarily to aid the unemployed; second, municipal departments having charge of public works upon which it is possible to give employment; third, labor organizations giving aid either by the usual out-of-work benefits or by extraordinary methods; fourth, private charities, including all permanent relief-giving organizations not connected with State or municipal governments; fifth, the permanently established relief agencies administered for the State and for municipalities, such as poor departments. No one of these agencies is complete in itself. The organization of a special relief committee is too apt to be delayed until suffering has been acute, and its methods are likely to be ill-considered if not injurious to society. The undertaking of new public works by municipalities is liable, in the present stage of political development, to be uneconomical, and possibly demoralizing to the civil service. Its virtue is that it may have less of the demoralizing taint of charity. Trade unions cannot make work, and generally oppose any reduction in the standard rates of wages in fear that they cannot recover the concession except by prolonged struggle. Nor do they possess adequate funds to meet extraordinary demand. Private charities are hampered by the cautious, and to able-bodied workmen often irritating, methods of investigation which must govern the ordinary administration of charity. Illustration of the work of all these agencies may be found in great detail in the *Report of the Massachusetts Board to Investigate the Subject of the Unemployed,* made in 1895, and in the *Report on the Agencies and Methods for Dealing with the Unemployed,* made by the Labor Department of the Board of Trade of Great Britain, in 1893.

The more permanent agencies which have been recommended for the relief of unemployment are as follows: (1) Publication at frequent intervals by responsible authorities, either trade or governmental, of the condition of the labor market, for the purpose of assisting workmen who seek employment, and of preventing an excessive migration from the country into the city. (2) The establishment of employment bureaus and registry offices in order to bring employers and laborers together more promptly. Neither of these agencies can greatly increase the amount of work to be performed; they do, however, reduce loss of time and futile effort. (3) Establishment of boards of conciliation and arbitration in order to prevent strikes and lockouts, which throw men out of work. (4) Adoption of a shorter day of work, so as to give opportunity of employment to a greater number of workmen. This recommendation, however, does not take into account the results of past experience; either the productive power of those working is proportionately increased by the reduction in hours, or the cost of production is increased, thus diminishing the purchasing power and standard of comfort of those dependent upon that particular product. (5) Restriction of immigration. In some industries, as the garment-making trade in the cities of the Atlantic seaboard, and the mining industry in Pennsylvania and Illinois, there has undoubtedly been a congestion of labor owing to an excessive influx of workmen from foreign countries; the restriction of immigration, however, involves so many consequences entirely apart from that of regularity of employment that its discussion must be omitted. (6) Establishment of labor farms or colonies for the purpose of training workmen for agricultural life. The most notable of these experiments are the Labor Colonies of Germany; that of Hadleigh, in England, established by the Salvation Army; the Jewish colonies in Alliance and Woodbine, New Jersey; and certain land settlements in New Zealand. Nearly every country has experimented along this line, but the results are not as a whole encouraging. It is undoubtedly one of the methods to be utilized, but it appears to be unfitted to serve as a complete remedy. Agricultural labor is not highly paid, and during the past half century has been subjected to enormous strains caused by the opening of new markets of supply. Nor can it be expected that a miscellaneous collection of workmen taken from the city will succeed in entirely new pursuits upon the land. Again, urban workmen who have been unused to farm life are likely to be attracted by numerous associations to the charm of city residence. Success can be hoped for only when the colonists are inspired by an earnest spirit, can settle upon land of especially favorable quality, and are supplied with a considerable amount of initial capital. (7) Insurance against unemployment. Many municipalities in Europe have adopted the so-called Ghent system of insurance against unemployment, which consists in subsidizing trade unions giving unemployment benefits to their members. All responsibility for establishing the fact of unemployment and controlling the distribution of the benefits is placed in this system upon the union. Approximately a quarter of a million workers in various cities are insured. Great Britain enacted in 1911 a law requiring compulsory insurance in construction and engineering trades, covering about 2,500,000 workmen. Up to the outbreak of the great war, the insurance fund had been able to meet all demands for unemployment benefits and had a considerable surplus to its credit. Contributions are required both from workman and employer, and the state adds a subsidy equal to one-third of these contributions. (See SOCIAL INSURANCE.) (8) The extension of state industrial enterprise. This in particular is the remedy offered by the Socialists. (See SOCIALISM.) (9) Industrial education. Opposed to the Socialist is the individualist who lays stress upon individual training by which the workman will be enabled to turn quickly from one employment to another in case of displacement. It is held that industrial evolution has proceeded at so marvelous a rate that it is impossible to avoid disturbance. Distress can best be met by a thorough preparation of the individual and the adoption of such measures as will tend to strengthen individual effort and to widen individual opportunity. Consult: W. H. Beveridge, *Unemployment: A Problem of Industry* (London, 1909); S. and B. Webb, *Minority Report of the Poor Law Commission* (ib., 1909); F. B. Sargent, "Statistics of Unemployment and Work of Employment Officers," in *United States Bureau of Labor, Bulletin No. 109* (Washington, 1913); "The Struggle against Unemployment: Symposium," in *American Labor Legislation Review,* vol. iv (New York, 1914), including bibliography. See LABOR COLONIES.

UNGAVA, ŭŋ-gā′vȧ *or* ŭŋ-gä′vȧ. A territory of Canada. In May, 1912, an act of the Canadian Parliament authorized its annexation to the Province of Quebec, and the same year it was erected into the Territory of New Quebec by an act of the Legislature of the Province of Quebec (Map: Canada, Q, R 5). New Quebec has an approximate area of 351,780 square miles. The population, including Labrador, consists of about 3500 Indians, 2000 Eskimo, and 8800 whites. The population is expressly excluded by law for the purposes of readjustment of representation of the provinces of Canada. It occupies, for the main part, a table-land having an average elevation of 1000 to 2000 feet, and composed almost wholly of Archean gneisses and granites, with some ancient Paleozoic, mainly Silurian, sedimentary rocks. In the northwest the land sinks to an altitude of 500 feet, while the shores of Ungava Bay, as well as portions of the Hudson Bay coast, are lower. At Cape Jones, at the entrance to James Bay, and at several other places the plateau approaches the coast. The surface of the plateau is an undulating plain scoured by glacial action, so that the rounded granite surfaces are exposed, surrounded by marshy depressions. Post-glacial river systems have not yet developed definitely, and the interior is a maze of surface streams and shallow lakes, the latter being so numerous that fully one-third of the total area is covered with water. The streams finally collect in a number of main rivers, which have cut deep valleys in the edge of the plateau, through which they descend to the coast by falls and rapids. These rivers have an enormous water power, that of Hamilton River being estimated at 300,000 horse power. About 90 per cent of the forests of New Quebec are spruce, which is supplemented by canoe birch, aspen, cedar, cypress, and poplar. Large forests of spruce and birch extend northward in the valleys as far as the fifty-seventh parallel, north of which the country is treeless, though there is an area of scrub where gooseberries, currants, huckleberries, and cranberries are abundant. The vegetation in the northern half consists of sphagnum bogs with sedges and Arctic flowering plants, followed in the extreme north by tundras, in which lichens, especially reindeer moss, are predominant. The sable is the most valuable of the fur-bearing animals, though ermine, lynx, beaver, and foxes are numerous. Overhunting has nearly exterminated the caribou—especially the woodland species. The shore fisheries along the coast of Hudson Bay are considered as the most productive of the natural resources of the Territory in the immediate future. Trout, whitefish, cod, and salmon are the most important fish. Immense deposits of magnetite, hematite, and siderite in the Cambrian formation are widespread, and promise to be of future economic importance. Carbonate iron ores, with large percentages of manganese, are found in great quantities in the Hudson Bay region, both along the coast and also on all the Hopewell islands, on part of the Nastapoka and adjoining groups. The climate is rigorous, but varies greatly in the 800 miles of latitude. In general the winters are colder and the summers warmer than on the Labrador coast. While minimum winter temperatures varying from —40° to —55° occur, there are large interior areas where the summer temperatures rise above 80° each year. Snow falls to the depth of 3 to 5 feet annually. Consult *Reports on Ungava, recently Added to the Province of Quebec, under the Name of New Quebec* (Department of Colonization, etc., Province of Quebec, 2d ed., Quebec, 1915).

UNGER, ụng'ĕr, Carl Richard (1817–97). A Norwegian philologist, born in Christiania. He was educated at Christiania University, where he was lecturer (1845–62), and professor from 1862 to his death. He became known through his accurate and discerning work in editing numerous Old Norse and Icelandic texts, first together with P. A. Munch and R. Keyser, later alone. Among them are *Heimskringla*, by Snorri Sturluson, *Olafs saga*, *Markinskinna*, *Konungs skugg-sjá*, mediæval romances, legends, and homilies. He also edited the monumental work *Diplomatarium Norvegicum* (vols. i–v, 1847–61, with C. A. Lange, and vols. vi–xv, 1863–1900, with H. J. Huitfeldt-Kaas).

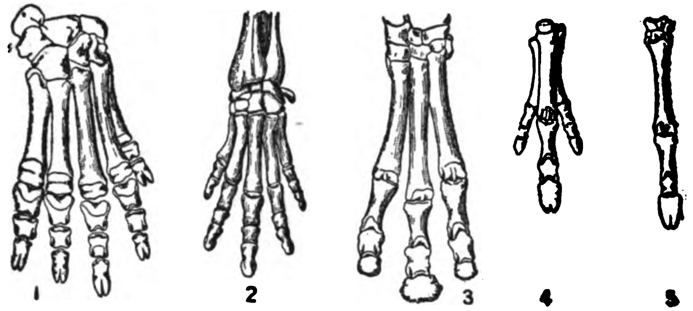
UNGER, ụng'ĕr, Franz (1800–70). An Austrian botanist, born in Styria. In 1836 he became professor of botany at Graz and in 1850 was called to Vienna. He was one of the pioneers in paleobotany, and also in ecology, a paper of his on the relation of soil to vegetation being one of the classics of ecology. He also did pioneer work in plant physiology.

UNGER, Joseph (1828–1913). An Austrian jurist and statesman. He was born in Vienna, studied law in that city, and after holding a chair at Prague was professor of jurisprudence in the University of Vienna from 1857 till his retirement many years later. He was greatly interested in the constitutional questions of Austria, and, in collaboration with Fischhof, published *Zur Lösung der ungarischen Frage* (1861). He became a member of the Lower Austrian Diet in 1867, and later of the Reichsrat, where he was active on behalf of the liberal programme. In 1869 he was called to the House of Peers. From 1871 to 1879 he was Minister without a portfolio, and in 1881 became the President of the Imperial Court. His chief work, an attempt to systematize the Austrian private law, was published under the title *System des österreichischen allgemeinen Privatrechts* (1856–59). Among his other works are: *Das österreichische Erbrecht* (1864); *Der Entwurf eines bürgerlichen Gesetzbuches für das Königreich Sachsen, mit besonderer Rücksicht auf das österreichische allgemeine bürgerliche Gesetzbuch besprochen* (1853); *Die rechtliche Natur der Inhaberpapiere* (1857); *Die Verlassenschaftsabhandlung in Oesterreich* (1865). With Glaser and others, he published *Sammlung von civilrechtlichen Entscheidungen des k. k. obersten Gerichtshofes in Wien* (1859–92).

UNGER, Karoline (1803–77). A Hungarian dramatic soprano, born at Stuhlweissenburg, near Budapest. She received her musical training from Aloysia Lange, Mozart's sister-in-law, and Johann Vogl, the great Schubert interpreter. Her début occurred at Vienna in 1821 in Mozart's *Cosi fan Tutte.* In 1824 she met Beethoven, who chose her to sing the solos in the first performances of his *Missa Solemnis* and *Ninth Symphony.* The scene of her greatest triumphs was Italy, where Mercadante, Pacini, Donizetti, and Bellini wrote many operas for her. At that time she wrote her name Ungher. After her marriage to a M. Sabatier in 1840, she retired from the stage, devoting herself entirely to the concert platform. She died in Florence. Her voice was powerful, but rather shrill in the highest register.

UNGER, ụng'ĕr, William (1837–). A German etcher. He was born in Hanover and was a pupil of Josef von Keller in Düsseldorf and of Thäter in Munich. In 1871 he became professor at Weimar; in 1881 at the Kunstgewerbeschule, Vienna, and in 1895 at the Vienna Academy. He became the foremost champion of reproductive etching in Germany—indeed, in Europe—reproducing the great masterpieces of the galleries at Brunswick, Cassel, Haarlem, Amsterdam, and Vienna, with an elegance of draftsmanship, delicacy of execution, and richness of color that have rarely been equaled. His principal work is *Galerie des Wiener Belvedère*, with text by Lützow. Consult Graul, *William Unger und sein Radierwerk* (Vienna, 1891).

UNGNAD, ụng'nät, Arthur Franz Eduard (1879–). A German Orientalist, born at Magdeburg. He was educated at the University of Berlin (Ph.D., 1903); served as an assistant in the Royal Museum at Berlin in 1905–09; and thenceforth was professor at Jena. Besides grammars, his publications include: *Analogiebildungen im hebräischen Verben* (1903); *Syntax der Gesetze Hammurabis* (1903–04); *Selected Babylonian Business and Legal Documents of the Hammurabi Period* (1907); *Selected Business Documents of the Neo-Babylonian Period* (1908); *Hammurabis Gesetz* (1909–11), with Kohler; *Aramäische Papyrus aus Elephantine* (1911); *Praktische Einführung in die hebräische Lektüre des Alten Testament* (1912).



EVOLUTION OF THE FOOT IN UNGULATES.

1, *Homalodontotherium* (Lower Tertiary); 2, *Hyracops* (Eocene); 3, *Theosodon* (Lower Tertiary); 4, *Proterotherium* (Lower Tertiary); 5, *Thoatherium* (Lower Tertiary).

UN'GUENT (Lat. *unguentum*, from *unguere*, to anoint), or Ointment. A medicament for external application, consisting of a fatty base holding an active agent. The base consists of prepared lard, prepared suet, or olive or almond oil, mixed with white wax, or of vaseline, or of lanoline. The unguents of the *United States Pharmacopœia* are those of boric acid, tannic acid, rose water (cold cream), belladonna, chrysarobin, diachylon (lead plaster), nutgall, mercury, ammoniated mercury, nitrate of mercury, yellow oxide of mercury, red oxide of mercury, iodine, iodoform, carbolic acid, tar, potassium iodide, stramonium, sulphur, veratrine, zinc oxide, and zinc stearate. See Ointment.

UN'GULA'TA (Lat. nom. pl., having claws or hoofs, from *ungula*, claw, hoof, dim. of *unguis*, Gk. ὄνυξ, *onyx*, nail, etc., OIr. *inga*, nail). An order of mammals including the elephants, hyracoids, hoofed animals, and related forms of the past; the ungulates. The earliest-known forms from the basal Eocene have many resemblances to the earliest Creodonta or primitive Carnivora, in the small brain, the number and kinds of teeth, the comparatively short legs and long heavy tail, and the five-toed feet. The relatively close relationship of the earliest ungulates with the Creodonts is admitted by all authorities. Both groups have probably been derived from insectivorous placental mammals of the Cretaceous period.

LEFT FOREFOOT OF CORYPHODON (AMBLYPOD TYPE).

The tendency of the group is very early shown in the development of a true herbivorous type of molar teeth, and in a type of limb adapted to running in the forests and on the plains. Some of the oldest forms have the foot semi-plantigrade, but the change through the digitigrade to the unguligrade foot, with only the terminal phalanx resting on the ground, occurs during the early part of the Tertiary period. Also in the earliest forms all the five digits were about equally functional, but began very early a specialization in two directions—the mesaxonic type with the axis of the foot in the third or middle digit, as in the perissodactyl or odd-toed forms, and the paraxonic type with the axis between the third and fourth digits as in the artiodactyl or even-toed forms. The connecting links between the great groups of ungulates have not been well established. The Condylarthra, represented by the Lower Eocene *Phenacodus*, seem to be the most primitive. The ungulates undoubtedly began to radiate in the Cretaceous, for, though none have yet been recorded for that era, there are in North America two well-marked groups, the Condylarthra and the Taligrade, in existence at the very base of the Eocene; the Taligrade specialized into the clumsy and bizarre Amblypoda (caryphodonts and uintatheres) and both groups became extinct before the end of the Eocene period. The radiation of ungulates continues through the Eocene, and during this period all the great groups became well differentiated. In North America the Perissodactyla are not found in the lowest Eocene formations (Paleocene) but appear in the succeeding Lower Eocene, apparently as immigrants from a northern centre. Of the Perissodactyla the Palæotheriidæ, Equidæ, Tapiridæ, Lophiodontidæ and Titanotheridæ appear in the Lower Eocene, the Hyracodontidæ in the Middle Eocene, and the Amynodontidæ and the Rhinocerotidæ in the Upper Eocene. It should be noted, however, that the earliest members of the Equidæ, Tapiridæ and Lophiodontidæ are so much alike that some authors class them all in the same family. The Amynodonts and Rhinoceroses are also derivatives of this older group. The great expansion of this group is in the Upper Eocene and Oligocene. The Proboscidea and Hyracoidea probably arose, at the latest, in the Upper Eocene of Asia or northern Africa. Besides these forms, which were common to most of North America and Eurasia, there arose in South America an ungulate fauna found nowhere else, consisting of four groups, Litopterna, Typotheria, Toxodontia and Pyrotheria. The first three of these seem to be entirely unrelated to other ungulates except to the Condylarthra. They flourished in the Miocene and Pliocene and became extinct in the Pleistocene. The Pyrotheria are regarded by Loomis as Proboscidea.

The ungulates are from the standpoint of human economy the most important, and have been the chief support of man since he attained supremacy, furnishing him with most of the food, clothing, and working assistance which he derives from animals. The four existing suborders are the Hyracoidea, Proboscidea, Artiodactyla, and Perissodactyla. See Hyrax; Elephant; Proboscidea; Ruminant; Bovidæ; Horse; Rhinoceros; and the names of allied groups and species. Consult: S. P. Woodward, *Vertebrate Palæontology* (New York, 1898); F. E. Beddard, "Mammalia," in *Cambridge Natural History*, vol. x (London, 1902); W. K. Gregory, "The Order of Mammals," in *American Museum of Natural History, Bulletin No. 27* (ib., 1910); H. F. Osborn, *The Age of Mammals* (ib., 1910).

UN′GULED. In heraldry (q.v.), a term applied to the tincture of the hoofs of an animal. Thus a stag represented with hoofs of a certain color is unguled of that color.

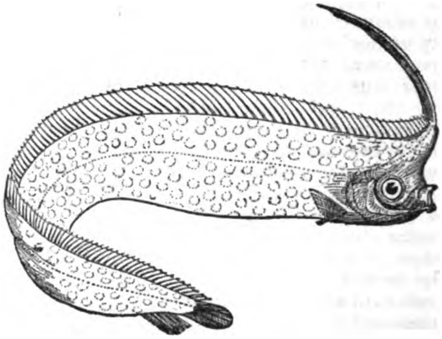
UNGVÁR, ụng′vär. A town of Hungary, capital of the County of Ung, 172 miles northeast of Budapest, on the river Ung, and on the Nyiregyháza-Ungvár Railway (Map: Hungary, H 2). The former castle is now a seminary. The manufacture of pottery and vine culture engage the people. Pop., 1900, 14,723; 1910, 16,840, mostly Magyars.

UNIATES, ū′nĭ-āts (Russ. *uniyatŭ*, member of the United Greek church, from Lat. *unus*, one). A generic term used to designate Eastern Christians, who, while in communion with Rome, are allowed to retain a number of their traditional local peculiarities in discipline and worship. As a rule they have their own liturgies in the Eastern tongues; they use leavened bread in the Eucharist (with the exception of the Maronites and the Armenians); their priests are allowed to marry once; and they have a body of canon law of their own, partly consisting of ancient conciliar decrees and partly of papal decisions made for their special case. Their government is cared for by a special committee of the Propaganda *super negotiis Orientalium* organized by Pius IX in 1862. The United Greeks may be divided according to the languages employed in their worship. Those with a Greek liturgy are found principally in Greece, European Turkey, Italy, and Russia, besides some 10,000 adherents in the United States. The Melchites (q.v.) employ the Arabic. There are also Rumanians with a vernacular liturgy; the Slavic is employed by the Ruthenians and Bulgarians. Under the name of Uniates are also comprehended the United Copts, descendants of the ancient Egyptians in Egypt and Abyssinia, the old Patriarchate of Alexandria; they have been united with Rome since 1732, and number some 30,000. To the Syrian rite belong the Maronites (q.v.), the Syrians proper in Asiatic Turkey, and some Syro-Chaldeans in the same region and in India. There are also Armenians in Turkey, Egypt, Russia, and Galicia; these returned to communion with Rome in the first half of the fourteenth century, and now number 150,000. The total number of Uniates is upward of six millions. See Nestorians.

U′NICORN (OF., Fr. *unicorne*, from Lat. *unicornus*, one-horned, from *unus*, one + *cornu*, horn). A fabulous animal mentioned by ancient Greek and Latin authors, and described as resembling a horse, and with one horn on the forehead. The unicorn is perhaps best known as a heraldic charge or supporter. Consult Robert Brown, *The Unicorn* (London, 1881); Charles Gould, *Mythical Monsters* (ib., 1886). See Bestiaries.

UNICORN. See Monoceros; Oryx.

UNICORN FISH. 1. A marine fish (*Lophotes cepedianus*), related to the oarfish and ribbon fishes (qq.v.). It has been taken both in the eastern Atlantic and off the coast of Japan, in rather deep water. It is about five feet long and silvery in color, with lighter spots and rosy fins. All the fins are minute except the dorsal, which extends the whole length of the back, and is preceded by the elevation of the crown of the head into a high crest, surmounted by an exceedingly long and recurved spine, from which the fish receives its name. Its habits are unknown. (2) One of the filefishes (*Alutera scripta*) common in the West Indies, and known there as "lija trompa." It is two or three feet long, olivaceous in color, streaked and spotted with blue and black, and has the snout produced, and a long and slender spine rising from the top of the head. Consult Günther, *Study of Fishes* (Edinburgh, 1880).


UNICORN FISH.

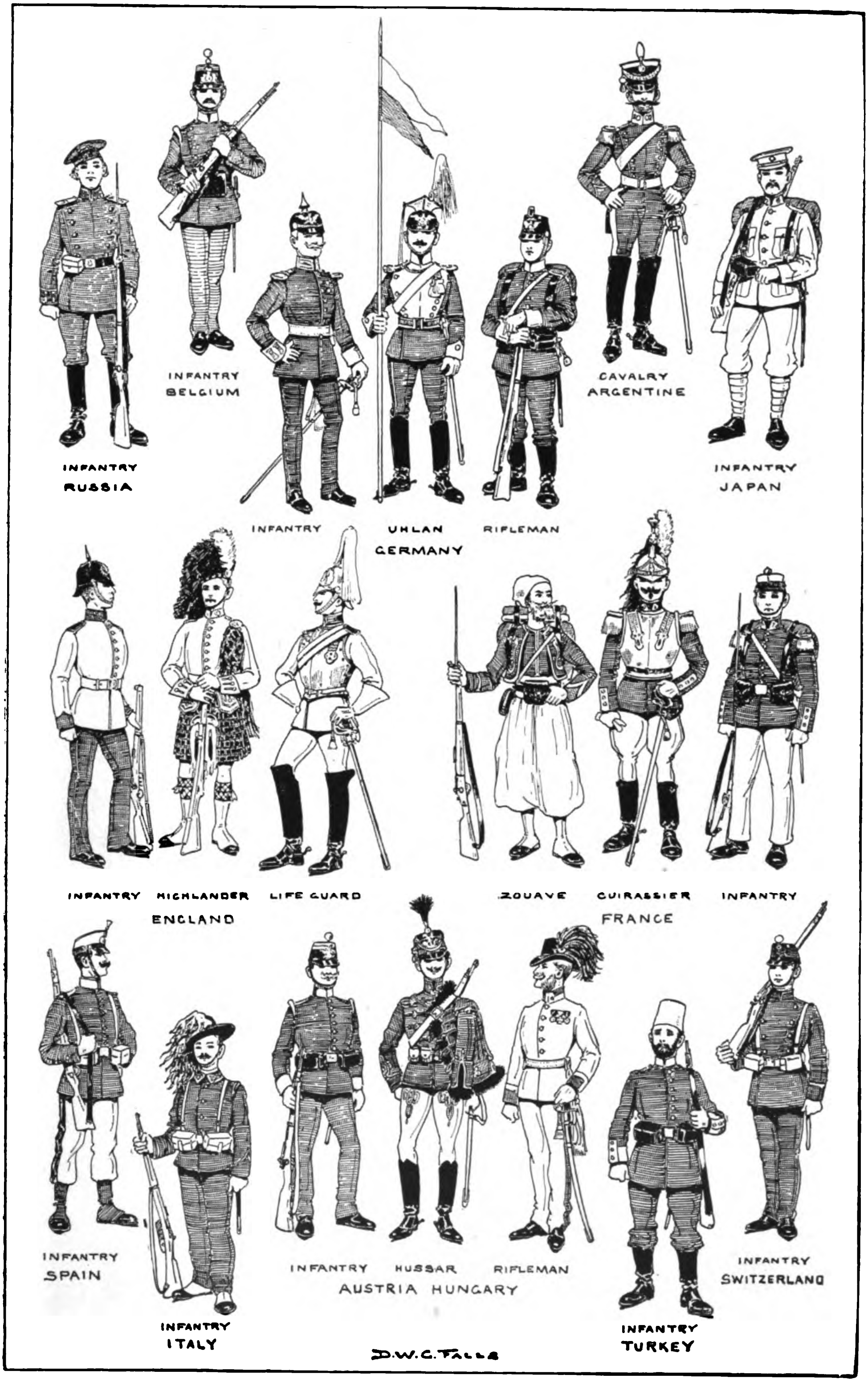
UNICORN PLANT. See Martynia.

U′NIFOR′MITA′RIANISM. In geology the theory which seeks to account for the past history of the earth in the light of the present. It assumes that the great changes which the earth has undergone are the results of slow-working but persistent processes rather than of catastrophic agencies. The theory was first clearly stated by James Hutton and found its ablest advocate in Sir Charles Lyell; it has had an important influence in the development of geological science. See Catastrophism.

UNIFORMITY, Act of. See Act of Uniformity.

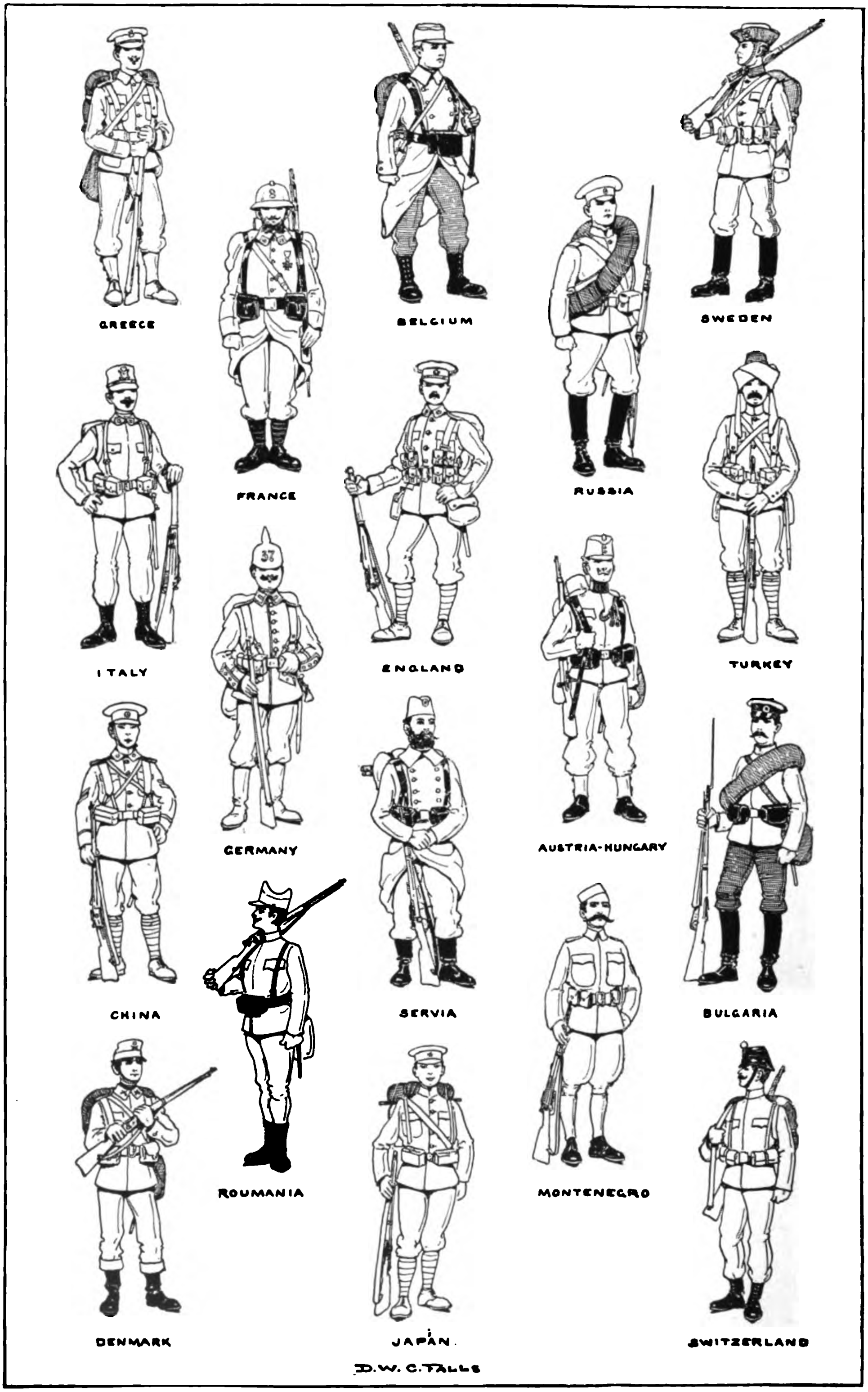
UNIFORMS, Military and Naval. A uniform is a distinguishing dress of a certain group or organization, as an army, society, etc. To obtain authentic records as to the first employment of costume devices, as they were then known, it is necessary to go back to the Crusaders. Armor (q.v.) was the badge of caste, and to distinguish one armored knight from another there were adopted and employed shields bearing what are now known as heraldic devices. (See Heraldry.) Likewise the difficulty of distinguishing men at arms, and followers of a king or nobleman, especially in battle, brought about the introduction of a distinctive badge or pattern of dress for all the retainers of a

UNIFORMS



MILITARY DRESS UNIFORMS, 1916

UNIFORMS



SERVICE UNIFORMS AT THE TIME OF THE EUROPEAN WAR, 1916 feudal lord or monarch. Thus in the Second Crusade the French wore red crosses on their sleeves and the English white. Henry VIII of England is said to have had the first completely uniformed body of men, when at the siege of Therovame his archers were dressed in white gaberdines, with caps of uniform color and design. In 1526 he arrayed the yeomen of his household in a uniform of red and black, and this costume for the Yeomen of the Guard (q.v.), or the Beefeaters, as they were formerly known, is still worn by the members of that distinguished corps.

France speedily followed England in uniforming the different corps of men at arms, and by the beginning of the seventeenth century all the countries of Europe had distinctive dress for their troops. From then until the end of the nineteenth century uniforms varied with the times, strongly influenced in cut and design by various changes in civilian costumes, such as wigs, long and short skirted coats, knee breeches, boots, and similar accessories, and what were the fashions of the times soon found their way into the dress regulations prescribed for the armies. Uniforms probably reached their height of splendor in the days of the Napoleonic wars, when the French Emperor made use of all possible spectacular effect to incite martial enthusiasm. In the days when the arms used on the battlefield had but a limited range, the wearing of showy uniforms made little difference, as the enemy's troops, even when plainly visible, could not be reached by fire except at short distances. The improvement of firearms, however, completely changed field operations, and showy uniforms, except for parade and garrison duty, have almost completely disappeared. The service uniforms of the armies of the military forces are now primarily designed for utility and to meet the conditions under actual war service. (See WAR IN EUROPE.) Such uniforms were first used by the English in India about 1880, and the color adopted was known as khaki (q.v.), a term which has become the recognized name for describing the field-service uniform, though technically khaki is a color and not a material. It was not until the Spanish-American War that the advantage of a field-service uniform was brought to the notice of the United States, while the South African War, a year later, proved to the world the necessity of such a uniform in days of high-powered armaments.

The main character of the uniforms of the armies of the world are indicated in the following summary:

Austria-Hungary. The uniforms of the Austrian army were for many years modeled after the French, with the exception that from as early as 1650 white was universally used for both coat and trousers for all branches of the service. Such uniforms made little difference as long as troops were manœuvred for battle at short distances, but in the war with Prussia in 1866, when more effective arms began to make their appearance, these conspicuous clothes caused disaster to the Austrian troops. A complete revision of the entire uniform regulation came later, and in 1890 the present bill of dress was adopted. The infantry tunic is of dark blue with collar patches of colors, or combinations of colors, by which the regiments are distinguished. Trousers are of light blue. Rifle regiments wear complete uniforms of gray. Dragoons, uhlans, and hussars wear tunics of dark blue with red breeches; the first two wear leather helmets and the last named shakos. Artillery wear brown tunics and red breeches and the engineers gray throughout. The army of Hungary for many years followed the picturesque national costume in which elaborate braiding, fur trimmings, and high boots were features. In 1867, with the consolidation of the two kingdoms, the Hungarian army was uniformed in accordance with the dress of the Austrians, though in the infantry they still retain the tight braided trousers of their national dress. Field-service uniforms were first tried out in 1902 and gradually the whole army was equipped with a bluish-gray uniform trimmed with distinctive colors. The cavalry retained their regulation helmets and shakos, made less conspicuous for field work by a gray cover, while other branches of the service have a cap conforming in color with the rest of the uniform.

England. As stated previously, uniforms were first introduced in the reign of Henry VIII. In his special guards in 1544 every soldier was required to have a coat of blue "guarded" with a red cloth. In 1585 English soldiers wore scarlet coats for the first time, but during the Civil War uniforms became much more sombre, and varied according to the colors of the troop leaders. King Charles and Prince Rupert chose scarlet for their respective guards, but this was not definitely adopted as the English color until Queen Anne's reign. By the close of the seventeenth century nearly the whole of the land forces of Great Britain were uniformed in scarlet or blue, the former color generally for the foot, and the latter for mounted troops, though there were exceptions. The organization of rifle regiments in 1800 caused the introduction of what is known as "rifle green" for this special corps.

The cut of the military clothing, the general style, the hats and equipment, all varied with the times. During the period when long tail coats were worn the tails were looped back for convenience in action, thus showing the lining of different colors. Regiments thus became known by the color of their facings as these turn-backs were called, and when the uniforms were modernized these facings were retained in the trimmings. Though English uniforms have followed the changes of dress in keeping with the times, they have, in many cases, retained certain characteristics of trimmings, ornaments, etc., that have kept to certain traditions. This is particularly true of the Highland regiments. They have always refused to give up their kilts, even when it was necessary to equip them in field-service jackets and caps. These privileges are regarded as inalienable rights in many organizations and, as they conduce strongly to esprit de corps, they have a value which offsets the strictly military views of the War Office.

The British army was first entirely equipped with a field-service uniform in the South African War of 1899–1902. The color adopted was the same as the khaki-colored uniforms which had been used in India. The cut was loose and comfortable; the coat supplied with patch pockets; the trousers and breeches were tight at the knee, and the lower legs were protected by boots or leggings of brown leather or a strip of woolen material, called puttees, wound around the leg. Though varying in color and details this type of uniform has been practically copied by all nations in their present field-service uniforms.

France. Uniforms were first worn in France by the entire army in the reign of Louis XIII. In 1670, when the wearing of the prescribed uniform was made compulsory, the infantry were ordered to wear white coats, faced with red. The cavalry had a similar uniform with leather breeches and high boots. Under Louis XVI the uniforms were modified, the infantry wearing white, the light cavalry blue, and the heavy cavalry green. With the Revolution the uniforms were simplified—consisting of dark-blue coats, white breeches, and high gaiters. Napoleon, on account of the difficulty of obtaining dyestuff, returned to white, but, substitutes for the old dyes being found, the colored coats were again introduced. During this period the French uniforms, particularly those of the officers, were probably the most elaborate ever worn. In 1815, with the restoration of Louis XVIII, the white uniforms were again taken up, only to give way to the blue in 1820. At the same time the famous red trousers were universally adopted for all branches of the service except riflemen, artillery, and engineers, who all wore blue. During the Second Empire a return was made to the extremely elaborate dress of the Napoleonic days, but the Franco-Prussian War of 1870 proved the uselessness of many of these uniforms for modern warfare. With the reconstruction of the army after the war the general scheme of color (blue and red) was retained and the uniforms were put on a more practical basis which, except for slight modifications, are as worn at the present time. The dragoons and cuirassiers still wear their metal helmets, and the latter also the cuirass. France is the only country to retain their relics of former military glory for service in the field.

Until the great war the French had never adopted any official field-service uniform for their army as a whole. Troops on duty in Africa had been supplied with khaki, while several experimental uniforms had been tried in sections of the home army. When the war broke out in 1914 the troops went into service in their historic blue and red; the heavy cavalry, however, concealed their helmets and cuirasses with grayish-brown covers. The impracticability of the uniform was soon discovered, and a colored cloth of light grayish blue was adopted. This was said to blend better with the surroundings in the field in northern France than the khaki worn by the English. Tradition is still strong in the French service, and though the army has been equipped with the above color for caps, coats, and overcoats, they still retain the red trousers in regiments for which they are prescribed. A further innovation in the field-service uniform in the war was the equipment of infantry with a steel shrapnel-proof helmet, the use of which was so beneficial to the men engaged in trench work that the English experimented with a similar device to be issued to their advance infantry.

Germany. Any historical sketch of the uniforms of the armies of Germany previous to the formation of the Empire in 1870 would exceed the space limits of this article. Each king and ruler of petty states maintained his own army, uniforming and equipping it according to his own or his government's ideas. The army of Prussia, under Frederick the Great, was brought to a splendid standard of efficiency, and its styles of uniforms soon after began to show themselves in the armies of the smaller German states. With the unity of Germany in 1871 the army was reorganized as an Imperial one and the Prussian uniform was adopted throughout the Empire except in Bavaria, where a lighter blue was used instead of the dark blue worn by the army in general. The modern German uniforms may be described as follows: Infantry—blue tunics, black trousers; facings according to regiments, scarlet, white, or light blue. Black leather helmets with metal spikes. Rifle regiments wear dark green instead of blue, and leather shakos. Cuirassiers—tunics of white. Dragoons and uhlans—blue, the former wearing helmets of metal, the two latter of leather. The hussars' tunics are of various colors according to regiments—their headdress busbies of brown fur. Artillery and engineers wear uniforms of blue throughout, with trimmings of black and scarlet.

Experiments with a field-service uniform were begun immediately after England's war with South Africa, but it was not until 1908 that a definite uniform was decided upon. The army has since then been gradually equipped with these: field uniforms of brownish gray, the cut and color of trimmings as prescribed for the ordinary uniforms retained, as well as the helmet, busbies, and shakos. These are concealed for service by a covering of the same color as the uniform. Military critics of the great war agreed that it was the most practical of the uniforms now in the field as far as adaptability for concealment is concerned, though the tight-fitting tunics and heavy helmets are unsuited for modern warfare.

Italy. The uniforms of the Italians have been rather French in character, particularly since the Napoleonic conquest of Italy, but of an endless variety of colors. Previous to the unity of the country in 1861 each separate kingdom and state maintained and dressed its army as it saw fit. Many attempts to establish uniformity were made previous to 1870, but it was not until that date that the entire army came under one dress regulation. These regulations were changed in 1890, at which time the present uniform was adopted. Infantry—dark-blue tunic, gray trousers, cloth shako; cavalry—dark-blue tunic, gray breeches; lancers—busbies; dragoons—helmets; artillery and engineers—dark-blue tunic and trousers. The distinctive corps of the Italian service is the Bersaglieri (q.v.). The Italian field uniform is extremely practical, the color being brownish gray, the cut loose and comfortable. It was first introduced about 1908, the entire army being equipped at the time of the war with Tripoli, in 1911.

Russia. The early Russian uniforms followed closely the costumes of the people until the reorganization of the army by Peter the Great when it was modeled after that of the Germans. With certain modifications this practice has continued except that the ground color has been green instead of blue and the helmets have been superseded in recent years by hats of a more distinctive Russian character. The infantry uniform in 1916 was dark green, with facings of red, blue, or yellow according to regiments. Cavalry wore green or blue coats with gray breeches. Artillery and engineers wear the same as infantry except for distinctive markings. All branches of the service, both foot and mounted, wear knee boots in which the trousers are tucked. The distinctive corps of the Russian service is the Cossacks (q.v.). Nothing was done in regard to a field-service uniform until the Russo-Japanese War in 1905, when in this respect the Japanese had a great advantage over their adversary. The Russian troops in the field were gradually supplied with makeshift service uniforms, and on the reorganization of the army after the conclusion of hostilities a field-service outfit was adopted, the color of which is olive drab, similar to that worn by the English, but the general cut and color markings of the regular uniforms have been preserved.

The uniforms of the smaller nations of Europe reflect, in a general way, those in use by their more powerful neighbors. Norway, Sweden, and Denmark incline to German styles. Belgium, Holland, Switzerland, Spain, and Portugal all favor the French; while in the Balkan region Rumania follows the French, Serbia Austrian, Bulgaria Russian, and Greece French with a leaning to English for field service. Turkey has been so long under German domination that their uniforms are distinctly on the line of the army of that country, with the exception of the universal wearing of the fez.

Of the two military nations of Asia the Japanese on the reorganization of their army on European lines largely copied the French, though their field-service uniform is modeled after that worn by the British army. They were thus uniformed for the field in the war with Russia in 1905, since which time the field uniforms have become the regular uniform of the army, the old colored uniforms being worn only by a few regiments of the Imperial Guard for occasions of ceremony. When China reorganized its army on European lines in 1902 it first adopted a mixed uniform, half Chinese and half European, but this speedily gave way to a more practical outfit of blue for dress and of khaki for service, the latter being rather German in cut and pattern, though many features were copied from the United States.

The principal South American countries all maintain armies, the organization of which was generally effected under the guidance of officers from European countries and the uniforms reflect the ideas of these organizers and early instructors, those of Brazil and Argentina being French and that of Chile, German. The uniforms of the smaller countries play but a small part in the armies—in many cases only the officers wear them. Mexico was distinctly French until the revolution following the fall of Diaz when the uniforms, such as they were, became American in general appearance.

UNITED STATES

The dress of the United States army prescribed in orders has in practice been marked by irregular and unauthorized modifications. This has arisen partly from the American tendency to sacrifice display to utility. At the beginning of the American Revolution each regiment provided its own uniforms, and later it became necessary at times to call upon the inhabitants to contribute cast-off clothing to clothe the patriotic soldiers. Such uniforms as were worn were English in design, substituting blue for scarlet coats. The close of the Revolution found the troops, generally, in a condition not unlike Falstaff's recruits. Measures were at once taken to uniform properly the few troops retained in service and the uniforms then selected closely followed the French, that of the infantry being blue faced with white, and the artillery, blue faced with red, these being then the only two arms in the composition of the army. Later cavalry was added, wearing green coats with white facings, which soon after changed to black. Since that time the uniforms of the army can be divided into periods, each of which dates back to the close of one of the wars.

Various changes were made in the bill of dress until the War of 1812, when the large number of militia organizations were hastily summoned into the service with their distinctive uniforms and the necessity of hastily equipping a large number of volunteer recruits made it impossible to adhere to the dress regulations, and the close of the war again found the army uniforms in a chaotic state. The reconstruction again brought in the French style of the period, and the dark-blue coat for all branches of the service was then adopted, the trousers or breeches being white or light blue. A later innovation was the clothing of the rifle regiments in gray. The different branches of the service, staff departments, etc., were each designated by a distinctive color or combination of colors in their trimmings. These varied at different times, as did the details until the Mexican War period, when after conclusion of hostilities the uniform regulations were again completely revised. Color trimmings were then positively adopted. Cavalry, yellow; infantry, light blue; artillery, red; medical department, green. All staff departments, black. As new departments were organized the following colors were added: engineers, red, piped with white; signal corps, orange, piped with white; ordnance department, black, piped with red; quartermaster corps, buff. The infantry color was changed to white, but in 1902 returned to light blue. At the same time maroon was substituted for green in the medical department. The colors given above are as used at present.

The beginning of the Civil War, on account of the influx of State organizations, found the army again clothed in a variety of uniforms, but before the termination of the conflict the undress, or service uniform, of the time (dark-blue coat, light-blue trousers with prescribed trimmings) was universally worn by both regulars and volunteers. Full-dress and show uniforms had entirely disappeared during the four years of active campaigning, and it was necessary to reconstruct the army bill of dress at the close of the war. The French style and cut were again copied, but no change was made in the colors or color trimmings. At the close of the Franco-Prussian War in 1870 there was a strong feeling that the uniform of a nation successful in war should be copied, and the new bill of dress prescribed the German cut of clothing with the spiked and plumed helmets.

The Spanish War of 1898 again brought into service large bodies of volunteers, but the State troops in recent years had been more or less uniformed in accordance with the army uniform regulations, and consequently there was less variety of dress than on former occasions of the calling in of volunteers. The heavy blue uniforms were found to be very unsuited for service in the tropics, and a service uniform of khaki cotton was introduced. The necessity of speed in equipping troops caused the government to supply clothing that varied in many ways from the regulations, and it was found impossible after the close of the war to readjust this state of affairs by alterations or reissues. The whole dress regulation, as it then was, was therefore wiped out in 1902. The new regulations made such radical changes that it was necessary to uniform anew the entire army. These regulations, except for minor changes, remain in force. In the new dress the result of the experience of all nations as to utility and ornamentation was considered. Officers' uniforms are classed as full dress, dress, and service. The full-dress coat for an officer is a double-breasted tunic with a collar of the color of his respective branch. Rank is designated on the shoulder knots and by braiding on the sleeve. The dress coat, except for general officers, is a dark-blue sack coat with concealed hooks instead of buttons and trimmed with broad black braid. Rank is indicated on the shoulder straps. Trousers are of a lighter shade of blue with the proper colored stripes. Officers also have a special dress for evening wear which, in the case of the coat, is cut on the lines of a civilian dress coat, trimmed as prescribed for the full-dress uniform coat and worn with a civilian dress shirt and white waistcoat. The enlisted men have but two uniforms—dress and service. The former is a single-breasted sack coat with facings of the branch of the service. Trousers or breeches are of a lighter blue, noncommissioned officers only having stripes of the proper color. Caps for officers and men are of the same design, the band being decorated with the proper colors, those of the officers having additional trimmings of gold lace.

In the 1902 dress regulations the olive-drab service uniform was first officially included. The color is a trifle darker and nearer a green shade than that known as khaki, and the uniform is prescribed in both woolen and cotton material according to the climate for which it is intended. The cut of these uniforms is similar for both officers and men, and follows closely the English model used in the South African War. The coat is cut with a loose and comfortable fit, supplied with four outside patch pockets, and the breeches (worn by all branches) confined below the knees with laces or buttons. The lower legs are protected by boots, or leggings of tan leather for officers, and canvas leggings for men. Overcoats, campaign hats, service caps, and other articles of equipment conform in color to the uniform. Designations of organizations, buttons, and other metal ornaments are made of bronze-colored metal. Officers wear their insignia of rank on the shoulder straps. See Military Insignia, and Plates under Infantry.

The National Guard, or, as it is officially known, the "organized Militia," of the United States, is now completely organized, uniformed, and equipped in accordance with the army regulations. There are a few historic organizations which for reasons of sentiment and tradition are allowed to retain their distinctive full-dress uniforms. These are provided and maintained at the expense of the members, are worn for parade purposes only, and never are used when ordered into the State or Federal service. The principal organizations which have retained their distinctive uniforms are the First and Second Troops, Philadelphia City Cavalry; Seventh, Twenty-third, and Seventy-first Infantry and Squadron A Cavalry, New York; First Corps of Cadets, Massachusetts; Fifth Infantry, Maryland; and Richmond Light Infantry Blues, Virginia.

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NAVAL UNIFORMS

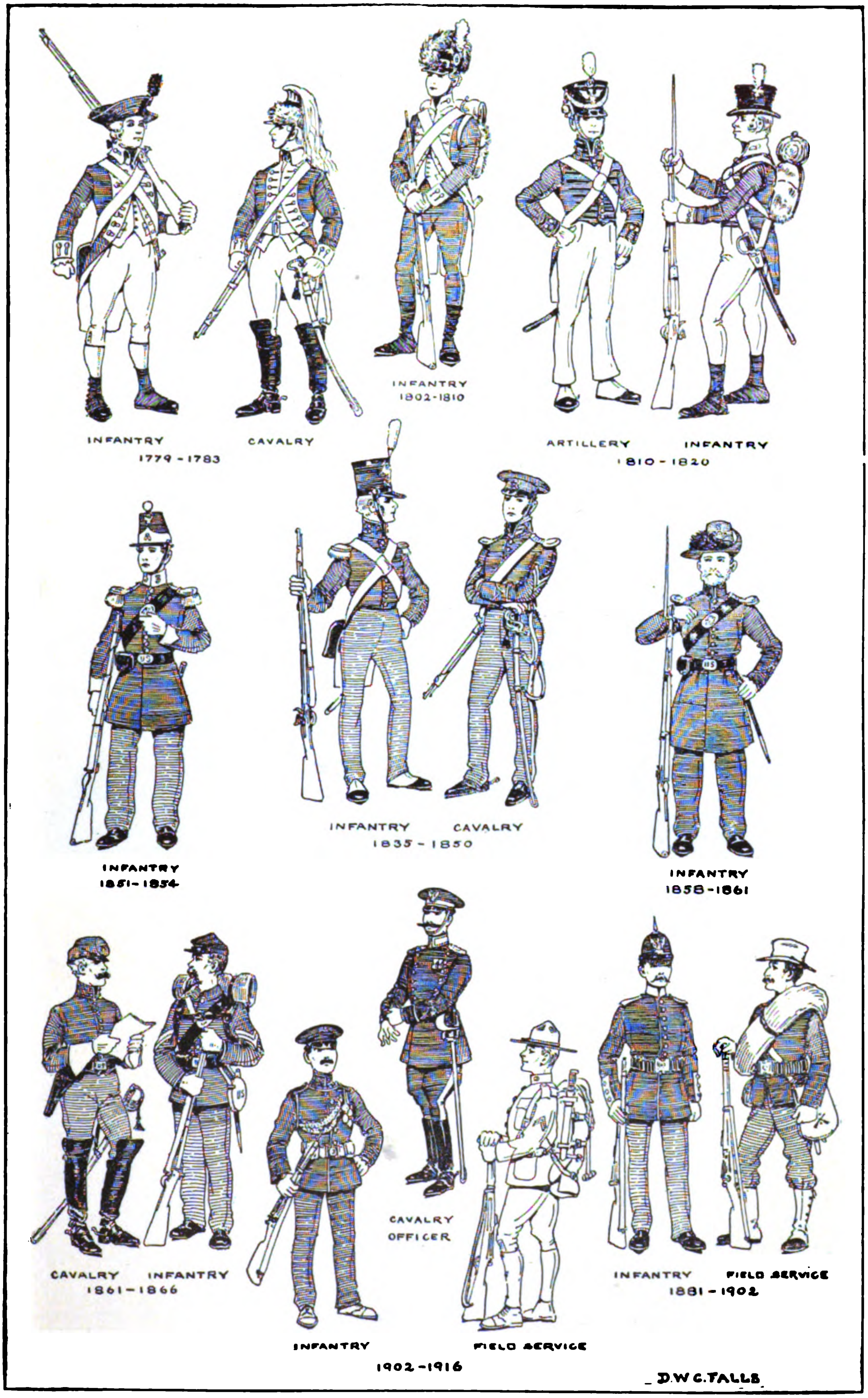
Modern naval uniforms are marked by the same general characteristics throughout the navies of the world, and resemble each other closely. This is due to the fact that naval officers and men are exposed to the same conditions and that the ceremonies and usages at sea obtain in much the same form under different flags. The uniforms of the United States navy, described below, may be considered fairly typical, and the deviations are usually in such details as epaulets, gold lace, insignia, etc., for which each service has its own minute regulations.

The uniform for the British navy closely resembles that of the United States navy. For officers there are eight different suits to be worn on specific occasions, as follows: full dress, ball dress, frock coat with epaulets, frock coat, undress, mess dress, mess undress, white undress. The undress uniform differs from that worn in the United States navy in that it has a double-breasted coat with brass buttons instead of the blouse trimmed with braid. On all uniforms the distinctive marks of rank are stripes on the sleeves and appropriate devices on the shoulder strap or epaulet. The significant degrees on the latter are as follows: admiral of the fleet, crown, and crossed cannon surrounded by a wreath; admiral, crown, crossed sword and baton, and three stars; vice admiral, the same, with two stars; rear admiral, the same, with one star; a commodore or senior captain has a crown and anchor and two stars, while a junior captain has the same with one star; a commander has a crown and anchor, a senior lieutenant a star and anchor, and a junior lieutenant an anchor.

The Russian navy in its dress resembles the British, but is less elaborate and has some peculiarities. Officers (in winter) wear a dark-blue frock coat, a reefer jacket, or a monkey jacket; in summer, white. The cap is high, flat-topped, and of the color of the dress worn. Cocked hats are required for full dress. In winter both officers and men wear a brown woolen cape, also goloshes over the boots. The Russian officer out of quarters is always in uniform. The enlisted man in winter wears a short gray overcoat, belted at the waist. On shore duty he wears a military tunic and leggings.

The uniform of officers of the United States navy consists of three classes—dress, undress, and service dress. The dress uniforms are, special full dress, full dress, dress, evening dress

UNIFORMS



DEVELOPMENT OF UNIFORMS IN THE UNITED STATES ARMY

A, evening dress B, mess dress. The undress uniforms are undress A and undress B. Service dress is either blue or white. The special full-dress uniform consists of a double-breasted blue broadcloth coat with standing collar and 18 gilt buttons, nine in each row; blue trousers with a stripe of gold lace down the outside seam; epaulets, cocked hat, sword, and full-dress belt. The undress A uniform consists of a double-breasted blue frock coat similar in cut to the civilian's coat, but having 10 gilt buttons, five each side, and with shoulder fixtures for epaulets; a blue waistcoat with seven gilt buttons, cap, sword, plain leather belt, and plain blue trousers. The service suit consists of a blue or white blouse with standing collar and trimmed with braid; blue or white waistcoat with seven gilt buttons; plain blue or white trousers. The evening dress suit is similar in cut to the civilian evening dress suit, but the buttons are gilt and the coat is fitted with shoulder fixtures for epaulets; the waistcoat may be blue or white as ordered. The mess dress consists of the white mess jacket, cut like the evening dress coat without the tails, white waistcoat, and blue or white trousers.

The various styles of uniform are made up from these. The special full dress is used on occasions of special ceremony. The full dress is used on less important occasions. It consists of the frock coat with epaulets, cocked hat, full-dress belt, and special full-dress trousers. The dress uniform, used for particular official calls, consists of frock coat, epaulets, cocked hat, plain belt, blue trousers. Undress A is the same as dress except that epaulets are not worn and the blue cap is substituted for the cocked hat; it is used for service on courts-martial, reporting for duty, etc. Undress B differs from undress A only in omitting the sword and belt. It is used for ordinary official and semiofficial calls, etc. Service dress is worn at all times when some other special uniform is not provided. The mess dress is worn at dinner when ordered.

On all except white uniforms the rank of an officer is indicated by gold lace on the sleeve and devices on the collar, epaulet, or shoulder mark. Ensigns and officers of that rank wear one stripe of half-inch gold lace; lieutenants of the junior grade, a stripe of half-inch lace and a stripe of one-quarter inch lace above it; lieutenants, two stripes of half-inch lace; lieutenant commanders, two stripes of half-inch lace and a stripe of one-quarter-inch lace between them; commanders, three stripes of half-inch lace; captains, four stripes of half-inch lace; rear admirals, one stripe of two-inch lace and one of half-inch lace above it; admiral, two stripes of two-inch lace and one stripe of half-inch lace between them. All officers of the line or executive branch wear a gold star on the sleeve above the lace. On the overcoat and white service coat the lace is worn on the shoulder marks instead of on the sleeve. The ornaments indicating rank, which are worn on the collar and epaulet, consist of the corps device and rank emblem. The former consists of a silver foul anchor for line officers, sprig of silver oak leaves for pay corps, gold oak leaf and silver acorn for medical corps, a silver oak leaf and acorn for professors of mathematics, silver cross for chaplains, two gold live-oak leaves and acorn for naval constructors, and the letters C. E. in silver for civil engineers. The rank emblem for an admiral is four silver stars with a gold foul anchor under the outer ones; for a rear admiral, two silver stars and a silver foul anchor or other corps device between them; for a captain, a silver eagle; for a commander, a silver oak leaf; for a lieutenant commander, a gold oak leaf; for a lieutenant, two silver bars; for a lieutenant of the junior grade, one bar. Ensigns and officers of that rank wear only the corps device.

White uniforms are worn in hot weather. The overcoat is of the ulster type with very broad collar and black rubber buttons. Rank is indicated by the shoulder mark and mohair stripes on the sleeve. Warrant officers wear no stripes on the sleeve and no shoulder ornaments. The collar ornaments are a crossed anchor for boatswains, a bursting shell for gunners, a gold chevron for carpenters, and a gold propeller for warrant machinists. When commissioned after six years' service, chief warrant officers wear a half-inch gold stripe with an inset of blue silk and silver collar ornaments.

The uniform of enlisted men consists of dress, undress, and working dress; each of these may be white or blue. Chief petty officers wear double-breasted blue or white coats with gilt buttons. Other enlisted men wear a blue shirt or white dress jumper for dress, with blue cloth trousers. Undress is merely less neat or new uniform, if blue; but white undress has a narrow white collar instead of a broad blue one; working dress is old blue or white uniform and is worn without a neckerchief. Rating badges for petty officers are worn upon the sleeve. Chief petty officers wear caps with visors and an ornament consisting of a gold foul anchor; other enlisted men wear round blue caps with a flat top projecting beyond the band all around the head when in blue uniform and a white canvas hat when in white.

U′NIGEN′ITUS. A papal bull issued in 1713 condemning the principles of Jansenism (q.v.).

UNIMAK, o͞o′nê-măk′. The largest and easternmost of the Aleutian islands (Map: Alaska, E 8). It is separated from the southwest extremity of the Alaska Peninsula by a narrow, unnavigable channel. It is 70 miles long; average breadth, 20 miles. Barren and mountainous, it contains two volcanoes, Pogromni, 6500 feet, and Shishaldin, 9387 feet, occasionally showing signs of life. There is a scant and shifting population of Aleuts.

U′NIO. The type genus of the family Unionidæ, which contains the greater part of the fresh-water mussels (q.v.).

UNION. See TRADE-UNIONS.

U′NION. A town in Hudson Co., N. J., adjoining Weehawken and West Hoboken, on the Rahway Valley Railroad (Map: New York City, Greater New York and Vicinity, B 4). It is of considerable importance as an industrial centre, being interested largely in the manufacture of silk and embroidered goods. There are also breweries and a shirt factory. Union has a Carnegie library. Pop., 1900, 15,187; 1910, 21,023; 1915 (State census), 21,739.

UNION. A city and the county seat of Union Co., S. C., 65 miles northwest of Columbia, on the Southern and the Union and Glenn Springs railroads (Map: South Carolina, C 2). It is the commercial centre of a farming and cotton-growing region, which also has truck and fruit interests. There are four large cotton mills, an oil mill, and two knitting mills. Noteworthy features are the Carnegie Library, high school, county courthouse, and Federal building. Pop., 1900, 5400; 1910, 5623.

UNION, Brotherhood of the. See Secret Societies.

UNION, Evangelical. See Evangelical Union.

UNIÓN, ōō'nê-ōn', La. A town of Murcia, Spain, near the Mediterranean coast, 5 miles east of Cartagena (Map: Spain, E 4). The country is a mineral region, producing iron, manganese, sulphur, and carbonate of lead. The town was founded in the second half of the nineteenth century. Pop., 1900, 28,479; 1910, 30,249.

UNIÓN, La. A province of northern Luzon, Philippine Islands (Map: Philippines, C 2). Area, 634 square miles. The province is mountainous and forested, but much of the land is well cultivated, producing tobacco, rice, cotton, corn, sugar, and cacao, while stock raising is also important. A telegraph line, as well as the main highroad and the unfinished railroad from Manila to Laoag, runs through the province. Pop., 1903, 137,839, chiefly Ilocanos and Igorots. Capital, San Fernando (q.v.).

UNIÓN, La. A port of the Republic of Salvador and capital of the Department of La Unión, situated at the southeast extremity of the country, on an inlet of the Gulf of Fonseca, and at the foot of the volcano of Conchagua. It exports minerals and carries on an active trade with the interior (Map: Central America, D 4). Pop. (est.), 5352.

UNION, National. See National Union.

UNION CITY. A city in Randolph Co., Ind., and adjoining Union City in Darke Co., Ohio, 84 miles northeast of Indianapolis, on the Cleveland, Cincinnati, Chicago, and St. Louis, the Dayton and Union, the Pittsburgh, Cincinnati, Chicago, and St. Louis, and the Ohio Electric railroads (Map: Indiana, H 4). It has a Carnegie library and the Ford Hospital. The leading manufactured products are automobiles, carriages, wheels, butter, furniture, and hoops. Pop., 1900, 2716; 1910, 3209 (Union City, Ohio, 1910, 1595).

UNION CITY. A borough in Erie Co., Pa., 26 miles southeast of Erie, on the Pennsylvania and the Erie railroads (Map: Pennsylvania, B 2). There are three large chair factories, planing and grist mills, a powdered-milk plant, and several furniture factories. Pop., 1900, 3104; 1910, 3684.

UNION CITY. A city and the county seat of Obion Co., Tenn., 112 miles by rail north by east of Memphis, on the Nashville, Chattanooga, and St. Louis, and the Mobile and Ohio railroads (Map: Tennessee, B 2). It is important as a shipping point for farm produce, chiefly wheat, corn, and hay, and manufactures flour, brooms, mattresses, decoy ducks, raincoats, and foundry and lumber products. Union City has a Carnegie library and the Nailling Hospital. Pop., 1900, 3407; 1910, 4389.

UNION COLLEGE. A coeducational institution of higher education at College View, Neb., founded in 1890, under the auspices of the Seventh Day Adventists. The campus consists of 22 acres, on which are the main college buildings. The college curriculum includes a department of Bible study, history, English, ancient and modern languages, mathematics, commerce, agriculture, education and normal training, expression, art, and music. The total enrollment of students in the autumn of 1915 was 420, and the faculty numbered 26. The library contains about 6000 volumes. The college property is valued at about $200,000. The president in 1916 was Harvey A. Morrison.

UNION COLLEGE. An institution of higher education at Schenectady, N. Y., incorporated in 1795. It was the second college incorporated in the State, and received its name from the coöperation of several denominations in its organization. In 1828 a scientific course was established parallel with the classical course. The progressive policy of Union at this period was due chiefly to the genius of Dr. Eliphalet Nott, president from 1804 to 1866. The college fraternity system originated at Union (1825). In 1873 the Law School, Medical College, and Dudley Observatory in Albany were associated with Union College under the title of Union University, and the Albany Course of Pharmacy was added in 1881. The degrees conferred in course are B.A., Ph.B., B.S., B.E., M.A., M.S., M.C.E., M.E.E., and Ph.D. The students in the college in 1915–16 numbered 494, and the faculty 41. The library contained 45,000 volumes, the invested assets were $98,000, the property valuation was $1,500,000, and the income $145,000. The president in 1916 was Charles A. Richmond, D.D., LL.D.

UNION JACK. The combined crosses of St. Andrew, St. George, and St. Patrick, used as the flag of Great Britain. See Colors; Flag; Jack; National Flags, *Great Britain*.

UNION LABEL. A trade-mark or advertisement owned and registered by a trade-union and attached to articles of sale, signifying that they have been made in establishments employing union labor only, and under conditions stipulated by the union. The label seems to have been first used by the California cigar makers about 1874. It appeals with particular force to the more conservative trade-unionists, who praise it as a peaceable and inexpensive way of increasing the power of the unions; they frequently describe it as the legal boycott. Its use is spreading rapidly. In most States statutes impose penalties for counterfeiting the label or knowingly using a counterfeit. In several trades, e.g., cigar makers, printing, and the hatters' trade, the label has become a factor of first importance.

UNION LEAGUE CLUB OF THE CITY OF NEW YORK, The. One of the leading social and political organizations of the United States. It was incorporated by the New York State Legislature, Feb. 16, 1865. The qualifications for membership are United States citizenship and absolute and unquestioned loyalty to the government of the United States. The club has been a stronghold of Republicanism and its influence has been repeatedly exerted for the Republican party in national and local elections. The number of annual resident members is limited to 2000, and 100 members constitute a quorum at all meetings. The club has quarters at Fifth Avenue and Thirty-ninth Street in New York City. Similar institutions of the same name and purposes have sprung up in other cities, notably in Philadelphia and Chicago.

UNION OF SOUTH AFRICA. A state of the British Empire, formed May 31, 1910, by the uniting of the self-governing colonies of the Cape of Good Hope, Natal, the Transvaal, and the Orange River Colony (now Orange River Free State), which became provinces of the union. For a description of the physiography and other natural features, see under South Africa, and under the individual titles of the provinces.

Geology and Mineral Resources. The discovery of diamonds and gold had a profound effect upon the condition and prospects of South Africa, bringing the country in a few years into universal notice. Many millions of dollars have been disbursed in wages and local expenses at the mines. (For geology, gold, and diamonds, see Cape of Good Hope; Transvaal; Kimberley; etc.) The copper mines of Namaqualand are unsurpassed in richness of yield. The principal silver mine worked is 50 miles east of Johannesburg, 6 miles from coal fields, but indications of silver have been found in many parts of South Africa. Enormous deposits of coal and iron have been discovered in Cape Colony and Natal in close proximity. Coal is also mined in the Transvaal and the Orange River colonies, and at the Wankie coal fields in Rhodesia, southeast of Victoria Falls. Platinum, plumbago, manganese, and the finest of marble, building stone, and lime are also among the mineral resources.

Agriculture. The soil is extraordinarily productive wherever rainfall is sufficient; but the chief interest is stock raising, the country, as a whole, being better suited for pastoral pursuits than for agricultural operations. Wool is the staple source of wealth, the grasses of the veldt and the pasture plants of the karroos being well suited for growing the finest wools. Many millions of sheep are pastured in the Cape Province, Natal, Orange Free State, the Transvaal, Bechuanaland, etc. Angora goats and cattle also abound. The "Cape horse" is not handsome, but is hardy and keeps in good condition on the veldt. Across the south end of the country is a strip of fine farming land, where wheat, maize, and all the crops of the temperate zone are very successful. The best wheat is grown along the southern border of the Orange Free State. In the Cape Province fruits are largely exported, and ostrich farming and cattle raising are important. It is to the advantage of South Africa that its great variety of climate enables it to grow nearly every cultivated crop. Sugar growing and tea planting in Natal have passed beyond experiment: sugar is now exported, and the tea is excellent. Coffee and arrowroot thrive on the moist coastlands.

Manufactures. Little attention has been given to manufacturing, chiefly on account of the sparsity of the white population. A large quantity of Cape wine and brandy is produced; they are of inferior quality, though improving from year to year. The chief centres of the manufacturing industries are in the Cape Province, where flour mills, tobacco factories, tanneries, diamond washing, and gold and copper reduction works are most prominent; and in the Transvaal, where there are saw mills, brick and lime works, machine shops, etc.

Commerce. Prominent among the "makers" of the country are still the traders, who load their heavy wagons, carrying three to four tons, with all kinds of goods desired by the black population, and trek from tribe to tribe, returning to town or port after many months to dispose of the ivory, horns, skins, and feathers received in exchange for their wares. The trekking trade has been the means of diverting most of the commerce, even of the Zambezi region, to the southern ports. The circulation of goods is to and from the seacoast, there being little trade between town and town, as all are supplied from the seaport centres. Except during the Boer War the "Cape trade" has steadily grown. Imports and exports, exclusive of specie, were valued in 1908 at £24,532,520 and £43,910,451; in 1913, £41,828,841 and £66,569,364. Great Britain controls nearly all exports, those which reach other countries being mainly through British channels. Gold, diamonds, and wool are the great export staples, with ostrich feathers, hides and skins, coal, and mohair next in importance. The exports of 1914 included gold, £35,664,000; diamonds, £5,487,000; wool, £4,238,000; and ostrich feathers, £1,343,000. Many of the imports (general manufactures, machinery, etc.) come from countries other than Great Britain. During 1913 the imports from the United States amounted to over $18,350,000, while the exports to it were $2,609,500.

Transportation and Communication. In the more settled districts there are fairly good roads with substantial bridges across the rivers. Mail carts, coaches, or bullock wagons ply between the railroad stations and all the larger towns not on the rail lines. There is now rail connection between all the important ports of the south and east coasts and the larger interior towns and mining districts. One may travel by rail from Cape Town to Salisbury, in Mashonaland, and thence to the port of Beira. It is expected that before many years the railway system of South Africa will be connected with that of Egypt. The length of government railway (the South African railways) in operation at the end of 1914 was 8486 miles. Post and telegraph offices, 2790; telegraph line, 15,021 miles; wire, 50,352 miles. Regular communication is maintained with Europe, America, and Australia.

Population. The population in 1904 was 5,175,824; 1911, 5,973,394 (3,069,392 male, 2,904,002 female). In 1911 the population comprised 1,276,242 whites, 4,019,006 natives, and 567,962 other colored persons. Of the total population in 1904, 21.58 per cent were white; in 1911, 21.37 per cent. Of the 1911 population of 5,973,394, about one-half was in Cape of Good Hope Province.

Government. The central government is in the hands of a Union Parliament which exercises supreme control subject only to the will of the British Parliament in London. In each of the four provinces there is a local assembly with power over purely local matters. The constitution of the Union is amended in the same way as an ordinary bill is passed, except in special matters, such as those relating to the equality of the Dutch and English languages and native rights in Cape Colony; such matters require a two-thirds majority of both Houses sitting in joint session.

The Parliament is composed of two Houses, a Senate of 40 members and a House of Assembly of 121 members.

In the House of Assembly the provinces are not represented strictly in proportion to population. From the Cape of Good Hope 51 members are sent, from the Transvaal 36, from Natal 17, and from Orange Free State 17. The conditions for voting are determined by each province; in the Transvaal and Orange Free State there is virtual manhood suffrage, in the Cape and in Natal there are property and educational qualifications. In the Cape natives are permitted to vote, but are disfranchised in the others.

The Union has two capitals; the Parliament sits at Cape Town but the centre of administration is at Pretoria. The executive consists of a cabinet of seven members appointed by Parliament and responsible to it. The prevailing law in the Union is the Roman Dutch system, although the English common law is gradually superseding it.

The first Governor-General appointed was Viscount Gladstone, son of the famous statesman, and the first Premier was General Botha at the head of a cabinet composed entirely of Boers, the leading ones being Smuts, Hertzog, and Fischer.

History. Almost from the very start the chief question before the Union was the treatment of the Dutch language. General Hertzog became an uncompromising advocate of the rights of Dutch to at least equal treatment with English. The matter was compromised by the use of both languages in all official communications. In the schools, the mother tongues of the pupils were to be used in the lower grades, and in the upper, English and Dutch were to be used alternately.

In 1912 a ministerial crisis was brought about by General Hertzog who accused Premier Botha of imperialism or too much leaning to the side of the British Empire as against the interests of South Africa. The question whether Imperial or South African interests should dominate came to the front as a result of the presence of many Hindoo laborers against whom restrictive legislation had been passed. A strike of Hindoos took place and serious rioting was the result. Their cause was taken up by patriots in India who prevailed on the British government to protest against the discriminating legislation. The matter was serious and the Botha cabinet favored a repeal or modification of these laws. The Nationalist party broke into two factions, one supporting Botha and the other Hertzog. The latter, with the support of the Unionists, attempted to wreck the ministry but failed, and he was obliged to resign. The matter was partially settled by removing many of the disabilities of the Hindoos, such as the special poll tax; and the restriction of emigration of Hindoos to South Africa was promised by the Indian government.

In 1913 came the great strike of the miners on the Rand. The men demanded an eight-hour day, recognition of their union and a share in the appointment of mine inspectors, all of which were refused by the mine owners. The strike was accompanied with great violence and the troops were called out to suppress it. General Botha intervened and brought about a reinstatement of the miners pending an investigation by the government. During the following year (1914) an attempt was made by the union to bring about a great general strike of all the miners. The government arbitrarily arrested the leaders of the movement and as a result the strike collapsed. It then forcibly deported to England the leading labor agitators on the Rand in order to prevent a recurrence of labor troubles.

The Union Parliament then voted an act of indemnity, exonerating the government for their arbitrary acts. Laws were passed prohibiting all forms of picketing, peaceful and otherwise; strikes on public works were made punishable by severe penalties. A resolution was also passed permitting the government to deport any one convicted of sedition or public violence. As a result of these antilabor laws, the working classes of South Africa organized a Labor party to oppose both the Nationalists and the Unionists. In the great war which began in 1914, the forces of the Union of South Africa successfully put down a revolt under General De Wet and also conquered many of the possessions of Germany in Africa. See WAR IN EUROPE; BOER; CAPE OF GOOD HOPE; NATAL; ORANGE FREE STATE; SOUTH AFRICAN WAR; TRANSVAAL.

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UNION SPRINGS. A city and the county seat of Bullock Co., Ala., 40 miles east-southeast of Montgomery, on the Central of Georgia and the Birmingham and Southeastern railroads (Map: Alabama, D 3). Cotton, cottonseed oil, spokes and handles, guano, and foundry and machine-shop products are manufactured. The city has a Carnegie library. It was incorporated in 1844. Pop., 1900, 2634; 1910, 4055.

UNION THEOLOGICAL SEMINARY IN THE CITY OF NEW YORK, THE. An institution, Presbyterian in origin but independent of all ecclesiastical control, founded in 1836 and open to students of every denomination of Christians. It offers a three years' course leading to a diploma with the degree of bachelor of divinity, a three years' course leading to a diploma without the degree of bachelor of divinity, a graduate course of not less than three years leading to the degree of doctor of divinity, and other special graduate courses. Candidates must be graduates of colleges of recognized standing, must complete satisfactorily 40 two-year hours of class-room work and must satisfy departmental requirements in Old Testament, New Testament, Church history, systematic theology, religious education, and practical theology. The requirements for candidates for the diploma without the degree are the same as those for the diploma with degree, with the exception that in the Old and New Testament Departments English substitutes may be offered for Greek and Hebrew exegesis. To obtain the degree of doctor of divinity candidates must be bachelors of divinity of five years' standing, must spend three years of graduate theological study, must be able to read Latin, Greek, and Hebrew, and use French and German with entire facility, must devote three years of study to a major subject, must choose two minors under the direction of the faculty, must pass searching examinations in the subjects chosen, and must publish a book which shall constitute in the judgment of the faculty a real contribution to theological science.

The seminary offers a number of merit scholarships with incomes of $100 to $175, prize scholarships of $250, a limited number of graduate scholarships, and two fellowships of $600 appropriated to the use of incumbents prosecuting special studies for two years either in the United States or Europe. The seminary buildings are on Broadway at 120th to 122d streets. The library in 1915 contained 123,000 volumes, 64,700 pamphlets, and 224 manuscripts. There were 32 professors and instructors in the same year, and 275 students.

UNIONTOWN. A city and the county seat of Fayette Co., Pa., 70 miles by rail south by east of Pittsburgh; on the Pennsylvania and the Baltimore and Ohio railroads (Map: Pennsylvania, B 8). The city is the commercial centre of a region containing extensive deposits of coal and iron. Its industrial establishments include coke ovens, a foundry, brick yards, and manufactories of glass, flour, etc. It was incorporated as a borough in 1796, and chartered as a city in 1915. Pop., 1900, 7344; 1910, 13,344; 1915 (U. S. est.), 19,960.

UNION UNIVERSITY. See Union College.

UNION VETERAN LEGION. See Veteran Legion, Union.

UNION VETERAN UNION. See Veteran Union, Union.

U'NISON (from ML. *unisonus*, having one sound, from Lat. *unus*, one + *sonus*, sound). In music, a tone of the same pitch as another. In this sense the term unison is identical with the interval of the prime. The term has, however, been extended so as to include all parts performing the same melody.

UNIT (formerly also *unite, unitie, unity*, from Lat. *unitas*, oneness, from *unus*, one). A certain fixed quantity employed for measuring other quantities and for stating their magnitude. Ordinarily a unit is the smallest complete measure of value, extension, duration, mass, etc. An arbitrary unit is one which may be employed in the form of a concrete standard and which is generally available for reproduction. An example of such a unit is the distance between two marks in gold plugs on a bronze bar in the possession of the British Board of Trade, or the British Standard Yard. Similarly the meter of the Archives at Paris (see Metric System) is an arbitrary unit. Fundamental units are those selected arbitrarily on account of the ease with which standards can be constructed or reproduced and from which other units can be derived. In the C. G. S. system (q.v.) the fundamental units are those of length, mass, and time, from which units have been derived for area, volume, velocity, force, work, etc., magnetic units, electro-magnetic units, etc. In certain instances the derived units in the C. G. S. system may be in such shape that they are not available for general use and either a multiple or a fraction must be employed. Such units are known as practical units. Examples of practical units in common use are the ohm, the volt, and the ampere. See C. G. S. System; Electrical Units; Mechanical Units; Metric System; Money; Weights and Measures; etc.

U'NITA'RIANISM. The word is sometimes used in a restricted sense as the belief that God is a single undivided personality (as contrasted with trinitarianism, which is the belief that in God there are three persons). In this sense it applies not only to part of Christianity but to many non-Christian religions. More correctly it means the system of religion of certain churches and individuals whose Christianity is of the liberal type. The essential characteristic of Unitarianism is its emphasis on spiritual religion as contrasted with all material expressions of it. All minor characteristics are implications of that. Its principal thesis is that at the core of all religions is the communion of the human soul with God, the life of God within the spirit of man; that all religions have this religion of the spirit. Religion is, then, an experience and an inner life. All forms, ceremonies, creeds, organizations, etc., in which this religion of the spirit expresses itself are of only secondary importance. Hence Unitarianism insists on emphasizing the inner reality of religion above all other things. It uses forms of worship, and organizes itself in various ways, but always subordinates these things to the religion of the spirit. The attitude of Unitarianism on all religious questions is to be seen from this point of view.

Creeds.—Unitarians have no creed. They hold that a fixed statement of belief is an obstruction to faith, and that as the life of God within the human spirit is a growing life, the consciousness of that life, which is faith, is to be allowed to grow continually. For purposes of instruction the beliefs of Unitarians are sometimes stated in definite form, but always with the proviso that the statement is not final. *Church.*—The church is regarded as the voluntary association of those who find fellowship in the religion of the spirit. It is not the source from which religion is to be drawn, rather is it a product of religion; an organization for comradeship in the growing life of the spirit. *Bible.*—The Bible is regarded as an endeavor of the religion of the spirit to express itself in literature; the record of the growing spiritual consciousness of a race. *Authority in Religion.*—The attitude of Unitarianism towards authority is central. As it regards the church and the Bible as outer expressions of the inner reality, the religion of the spirit, it refuses to grant to either an authority over the human mind, though both are useful in an exalted degree in the growth of spiritual consciousness. Here is an essential contrast with other divisions of Christianity: Catholicism which assigns to the church the final authority, and the various forms of Protestantism which regard the Bible as the final authority. Unitarianism insists strongly that the final authority in religion is in the inner life, that God Himself speaks there to the living spirit; that He speaks in reason, conscience, experience, and the highest perceptions of the spirit and the fullness of human thought. It holds that the religion of the spirit has not only a priority in time but a present logical priority to the church and the Bible, and that these, being the outcome of the inner life, cannot have a supreme authority over it. *Freedom.*—Unitarianism asserts freedom as an absolute essential of religion. No forms of worship are binding, no statements of faith are final, no tradition even of spiritual experience is the last word. *Higher Criticism.*—The higher criticism of the Bible is welcome, as throwing light on the progressive expression of spiritual consciousness. *Science.*—Unitarianism finds no conflict between science and religion, holding that science is discovering divine truth and that it cannot contradict the truths of religion. *God and Jesus.*—Unitarianism regards the inner experience of God as being an undifferentiated experience of one God; and it identifies the Divine Power of the universe with the God of inner experience. God was to Jesus an inner experience, and Jesus was fully obedient to the will of God. Thus Jesus was a man through whom men have learned much about God, and in whom they have seen an ideal of human life; but Unitarians do not regard Jesus as deity or one of the persons in a Trinity, but hold that the God in him is the one God of spiritual experience and the Invisible Presence of the whole world. Jesus is regarded as the highest expression of the religion of the spirit.

These important characteristics of Unitarianism are thus grouped around its supreme emphasis on God in the inner life of man. It is modernism in its most thorough form. The history of Unitarianism is best read in the light of its progress towards this end; for, putting aside outer compulsion, there is a general agreement in this position not only among individuals and churches in their voluntary associations but among the Unitarians of all lands.

Unitarians trace the history of the movement from the monotheism of Judaism through Jesus and the whole course of Christianity. They hold that when the religion of Judaism attained to the faith in a universal God, God was conceived as a single personality. They accept the teaching of the higher criticism of the Old Testament that there were two systems of religion: the "religion of the spirit" which the prophets taught, each prophet carrying the truth one step further as spiritual consciousness cleared; and the religion of outer forms, with the system of blood sacrifice, which came down from primitive times. They find in Jesus the greatest in the succession of the prophets of the religion of the spirit and hold that he believed in one God: they hold that Unitarianism is the religion of Jesus, laying great emphasis on the saying "Hear, O Israel, Jehovah our God is one, and thou shalt love Jehovah thy God with all thy heart . . . and thy neighbor as thyself."

They interpret Jesus as being in the succession of the prophets of the religion of the spirit and reject the idea that his primary purpose was to fulfill the sacrifices of blood; hence they reject the idea of a blood atonement, as they regard the sacrificial system of the Jews as an unworthy form of religion. Consistently with this they reject the doctrine of the virgin birth and of the resurrection of the body of Jesus, holding that it was his spirit which entered into immortal life. The miracles are not regarded as a setting aside of any law.

They hold that the faith in God's single personality was the common faith of the early church; that in the fourth century the Arians, who held this view, constituted nearly one-half of Christendom, and that it was only physical force which gave the trinitarian formula, a late invention, its hold on later centuries. It traces a continuity of the Arian faith, even in the face of persecution, through the whole course of Christianity.

Among the first expressions of that spirit which resulted in the Protestant Reformation was the Unitarian idea. It is impossible definitely to separate the antipathy to the doctrine of the Trinity from the revolt against all ecclesiastical authority—authority which enforced that doctrine. At the same time, early in the Reformation period men who held the Unitarian theological position were persecuted and even martyred, e.g., Michael Servetus, who was burned at the stake in 1553, after more than 20 years of writing, by which he had stimulated thought in the direction of Unitarian doctrine. The translation of the Bible into the language of the European nations, the invention of the printing press, and the consequent multiplication of the copies of the Bible, making it easily accessible to the common people, had an enormous influence upon the course which the Reformation took. In the revolt against the authority of the church many of the reformers substituted the authority of the book, and thus created the position which several Protestant denominations of the present day hold. But from the very beginnings of the Reformation there were those who took distinctly the position of modern Unitarianism in regard to authority in religion, declaring that authority is in the inner life, conscience, reason, experience, spiritual intuition, and the voice of God speaking through these higher powers of the soul, and that over this life of the spirit no organization and no book can have absolute authority.

In the Unitarian movements of the Reformation period there are four important characteristics: first, the spirit of toleration; second, the minimizing of the importance of outer religious things as being nonessential; third, the repugnance to any formulated creed which could restrict the growing thought of man; and fourth, the historical study of Scripture and the right of human reason to judge of the spiritual value of the Bible or any part of it.

Martin Cellarius, 1499 to 1564, is commonly regarded as the first writer of the movement. He was a friend of Luther, but differed from him on this fundamental position of the authority of Scripture. A number of leading scholars of northern Italy met in 1546 at Vicenza and made a definite affirmation of Unitarian doctrines. They were persecuted vigorously, and those who were not killed fled to Switzerland, Transylvania, and Poland, scattering the seed of their thought far and wide. Socinus settled in Poland in 1579. In 1600 there were more than 400 Socinian churches in Poland. A printing press disseminated Unitarian views; more than 1000 students were gathered in a Unitarian college in Rakow. In 1658 persecution of these Unitarians began. Thousands died, other thousands fled, and in 1670 the organizations had been utterly obliterated in Poland, and Unitarianism ceased, except as it continued as the theological conviction and spiritual life of individuals and obscure groups.

In Transylvania and Hungary, Francis David was the first Unitarian Bishop. Persecutions broke out and Francis David was thrown into prison at Deva, and died in 1579. It was in Poland and in Hungary that religious communities were formed which took the definitely antitrinitarian position. In this and other lands the persecution which Unitarianism had to encounter was from two sources: Catholicism, against which the whole reformation movement was a revolt; and Protestantism, which still held the doctrine of the Trinity, and also was gradually adopting the dogma of the authority of the Bible. Thus the Unitarian movement was caught between the upper and the nether millstone. In Hungary, Unitarianism was tenacious, and survived two centuries of bitter persecution. Though in 1791 religious toleration was decreed by the king, as late as 1857 a last effort was made to crush Unitarianism. At present there are 166 congregations, with 80,000 members. They have still a bishop, and the theological school, founded about 1556 by John Sigismund, is in Kolozsvar, where Francis David, the first bishop, preached so effectively. Four periodicals are published.

In England, from the period of the Reformation, Unitarian thought was at work, and the teachings of Socinus and Servetus were influential. Such men as John Milton, John Locke, and Sir Isaac Newton were Unitarians. The open expression of opinion and organization were checked by persecution. The last Christian martyrs in England were Unitarians. When in 1689 the Act of Toleration permitted the building of even orthodox nonconformist chapels, a number of English Presbyterian churches left their trust deeds open and gave freedom of theological opinion. This freedom was the atmosphere for the Unitarian emphasis on the religion of the spirit, and in time many of these churches became Unitarian in spirit and theology. In 1774 Theophilus Lindsey, on the denial of a petition of a group of clergy in the Church of England for latitude of opinion, left the church and went to London and established the first avowedly Unitarian church in England. Many existing churches grouped themselves in a new fellowship and new Unitarian churches were formed. In 1825 the British and Foreign Unitarian Association was formed and now includes about 400 churches in Great Britain and Ireland, with headquarters on the site of Lindsey's church in Essex Street. During the nineteenth century the leader of Unitarian thought in England was Dr. James Martineau, of Oxford.

The first seeds of Unitarianism in America are to be found in the spirit of the Pilgrims who went from England to Leyden, Holland, and thence to America. Their church in Plymouth had a spiritual covenant instead of a creed. That covenant, though brief, set forth the thought that the revelation of God's truth is a growing revelation. Other early churches in New England, notably the First Church in Salem, were similarly organized with a covenant instead of a creed. Through all the early life of the American Colonies the attitude of many of the churches was thus expressed. There was latitude within the same church for both Trinitarian and Unitarian opinion. There is a curious relation between the Wesleyan revival and the definite organization of Unitarianism in New England. In the early years of the revival George Whitefield worked with the Wesleys, but when Whitefield's thought led him into what Wesley regarded as extreme Calvinism, they separated. Whitefield went to New England, and there as a preacher of Calvinism stimulated the Trinitarian party in the Congregational churches to an intenser dogmatic expression. This was one of the influences towards the drawing of sharp lines of distinction between Trinitarian and Unitarian theology, forcing ministers and churches to decide that they must choose the fellowship of one party or the other, and leading the two parties to organize as separate denominations. From 1785 to 1800 many of the Congregational churches took a distinctly Unitarian position, and these years were followed by decades of bitter controversy.

The first church in America to become definitely Unitarian was King's Chapel in Boston, which had been Church of England. In 1787 it excised the trinitarian phrases from its liturgy, and ordained James Freeman, avowedly a Unitarian. Joseph Priestley, the discoverer of oxygen, was driven out of England in 1794 by persecution for preaching Unitarianism, and established Unitarian churches in Philadelphia and Northumberland, Pa. In the same decades several other new churches distinctly Unitarian were organized. In 1805 Henry Ware, a Unitarian, was made professor of theology in Harvard; lines of division led to the establishment of the orthodox Andover Theological School (which, after just a century, moved to Cambridge and affiliated itself with Harvard). In 1819 Dr. William Ellery Channing of Boston preached the Baltimore sermon which contrasted Unitarianism and Calvinism so clearly that within a year nearly 150 of the New England Congregational churches declared their adhesion to Channing's position. Every church in Boston but one declared itself Unitarian in this period. Ralph Waldo Emerson and Theodore Parker were leaders of Unitarian thought. In 1825 the American Unitarian Association was organized, and there were in 1916 about 488 Unitarian churches in the United States. To James Freeman Clarke is attributed the authorship of the "five points of Unitarian faith" as contrasted with Calvinism: The Fatherhood of God, the Brotherhood of Man, the Leadership of Jesus, Salvation by Character, and the Progress of Mankind onward and upward forever.

The essential spirit of Unitarianism is incompatible with any narrow sectarian zeal; hence Unitarians have done more in public service than in building a denomination. In philanthropy, education, national life, literature, and other work for humanity the members of these churches have been conspicuous out of all proportion to their numbers. Among the poets, Bryant, Longfellow, Lowell, and Holmes; among educators, Horace Mann and C. W. Eliot; the Presidents, Thomas Jefferson, John Adams, John Quincy Adams, Fillmore, and Taft; statesmen, Sumner and Webster; in philanthropy the pioneer Tuckerman—are a few names from scores.

The International Council of Unitarian and other liberal religious thinkers and workers was organized in 1900 and has held congresses in London, Amsterdam, Geneva, Boston, Berlin, and Paris. Two thousand representatives of 30 nationalities and 60 religious communions have been enrolled.

The declaration of the Unitarian General Conference in America is "These churches accept the religion of Jesus, holding in accordance with his teaching that practical religion is summed up in love to God and love to man." The American Unitarian Association (Boston) is the executive organization and promotes religious education, social service, evangelism, publishing, building, and support of churches, and other enterprises. Unitarian ministers are trained in America at the Harvard Divinity

School (endowed by Unitarians), Meadville Theological School, Pacific Unitarian School for the Ministry (Berkeley); in England, Manchester College, Oxford, Unitarian Home Missionary College, Manchester; in Wales, Presbyterian College, Carmarthen; Hungary, Unitarian College, Klausenburg.

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UNIT CHARACTERS. See MENDEL'S LAW.

UNITED AMERICAN MECHANICS, JUNIOR ORDER OF. A secret, patriotic, political, beneficiary society, formed in 1853 at Germantown, Pa., as a branch of the Order of United American Mechanics, to prepare young Americans for membership in the latter. It became an independent organization in 1885 without the junior age limitation as to eligibility for membership. It declared for restricted immigration, protection to Americans, the American flag on and the reading of the Bible in the public schools, and has the picture of the "little red school house" among its emblems. It pays sick and funeral benefits to members and their beneficiaries, more than $10,000,000 having been so paid out since the society was formed. It has state or governing councils in 26 States, 2300 subordinate councils, and a total membership (1915) of about 236,000. Membership is most numerous in Pennsylvania, New Jersey, and nearby States. See SECRET SOCIETIES, PATRIOTIC-POLITICAL.

UNITED AMERICAN MECHANICS, ORDER OF. A patriotic, political, benevolent secret society, founded at Philadelphia in 1845, an outgrowth of the native American political agitation and disturbances of that period. "Only native Americans or men born under the American flag" were eligible as members. The word Mechanics was used, apparently, symbolically. The society stands for the maintenance of the American flag on the public schools, opposition to union of church and state, offers aid to Americans in a business way, has a fund for the relief of widows and orphans of members, and opposes injurious competition from immigration. It is the parent of the Junior Order, United American Mechanics (q.v.), which has since become independent of the mother organization, which it greatly exceeds in number of members. It has governing or state councils in 17 States, 464 subordinate councils, and nearly 37,000 members. See SECRET SOCIETIES, PATRIOTIC-POLITICAL.

UNITED BAPTISTS. See BAPTISTS.

UNITED BRETHREN, THE. See MORAVIANS.

UNITED BRETHREN IN CHRIST, THE. A religious denomination which arose among the Germans of Pennsylvania, under the preaching of Philip William Otterbein (q.v.), an ordained pastor of the German Reformed church, and Martin Boehm, a preacher among the Mennonites. As their converts increased, laymen were licensed to preach. Their first formal conference met in Baltimore (1789), and their first annual conference at Frederick, Md., in 1800. Here their name was chosen, and Otterbein and Boehm were elected first bishops. The first General Conference met in 1815, when a Confession of Faith and a Discipline were adopted.

The organization of the United Brethren in Christ includes quarterly and annual conferences, and a quadrennial general conference, which is the only legislative body, and since 1901 has been composed of an equal number of ministers and laymen. The superintendency of the church is vested in the bishops, who, with the general church officers, are elected every four years by the general conference. Since 1889 women have been eligible to the ministry. All ordained preachers are elders, the only order recognized. Members are forbidden the use of intoxicating liquors, and must not traffic in them. Slavery was prohibited after 1821. Their theology is Arminian. They accept two sacraments, baptism and the Lord's Supper. The mode of baptism is left to the choice of the candidate. Infant baptism is practiced. The spiritually dynamic presence of Christ in the Lord's Supper is acknowledged. The practice of foot washing is discretionary. The government of the church is democratic. The itinerant system is enjoined, but pastorates are not limited as to time.

A commission appointed by the General Conference of 1885 prepared, without doctrinal change, a restatement of the Confession of Faith and a revision of the Constitution, which, having been approved by the members, was adopted and proclaimed by the General Conference of 1889. It provided for lay delegates to the General Conference and set aside a rule prohibiting membership in secret societies. At this time Bishop Milton Wright and 14 of the 125 delegates composing the conference withdrew and formed a branch of the church, which adheres to the former unrevised Confession of Faith and Constitution.

The larger division of the church, which accepted the new Constitution, had, in 1915, 39 annual conferences and mission districts, including those in Germany, Japan, Ontario, West Africa, China, Japan, Porto Rico, and the Philippines, eight bishops, 2395 ministers, 341,845 members, about 448,975 pupils in the Sunday schools, 3556 church houses, and it contributed for all purposes $3,102,871. It has a theological seminary at Dayton, Ohio, 10 colleges, and several academies. It has a publishing house at Dayton, and issues from its presses 26 different publications, aggregating over 10,000,000 copies annually. There are a Board of Education; Home, Frontier, and Foreign Missionary Societies; a Woman's Missionary Association, conducting missions in Africa, China, and the Philippines; a Church Erection Society; a Young People's Christian Union; and a Historical Society. The combined missionary contributions for 1915 amounted to over $200,000. The total value of property held by the denomination is over $12,000,000.

The branch which retains the old Constitution had, in 1915, 32 annual conferences, 4 bishops, 310 preachers, 515 churches, 21,172 members, about 30,000 pupils in the Sunday schools, 540 church houses, and aggregate contributions amounting to over $150,000. There are a Home, Frontier, and Foreign Missionary Society, sustaining missions in 16 conferences and mission districts, and a Woman's Missionary Association, a Board of Education, and colleges at Huntington, Ind., Albion, Wash., and in Oregon.

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UNITED EVANGELICAL CHURCH, The. A religious organization formed in 1894 as the result of a division which had occurred in the Evangelical Association (q.v.). A meeting attended by delegates from six annual conferences was held at Naperville, Ill., in November of that year, and constituted the first general conference of the United Evangelical church. The legislation necessary to perfect the organization of an independent church was enacted; a book of discipline was adopted, based upon the old discipline of the Evangelical Association, with certain changes, such as the introduction of lay representation into the conferences.

In 1914 the United Evangelical church had 10 conferences (including seven mission conferences), 975 organized congregations, 2 bishops, 528 preachers, 86,635 church members, and 85,000 pupils in Sunday schools. Besides assisting the seven mission conferences, the General Missionary Society has three missions in Honan, China; and the Woman's Missionary Society coöperates with it. The church raises about $100.000 for missions yearly. A Church Extension Society was established in 1902. The educational institutions are Albright College, Meyerstown, Pa.; Dallas College and La Creole Academy, Dallas, Oreg.; Western Union College, Le Mars, Iowa. Besides Sunday-school and similar publications the church periodicals are *The Evangelical* (weekly), *Die evangelische Zeitschrift* (weekly), and *The Missionary Tidings*, all issued at Harrisburg. Consult Ammon Stapleton, *Annals of the Evangelical Association of North America and History of the United Evangelical Church* (Harrisburg, 1900).

UNITED EVANGELICAL CHURCH, The (in Germany). A church established in Germany in 1817 by the union of portions of the Lutheran and Reformed churches. Such a union had been attempted without success in 1529, 1631, 1661, and by Frederick I of Prussia (1703–22). Frederick William I published several decrees having the same object in view. It was favored also towards the end of the eighteenth century by the progress of theological thought. Schleiermacher proposed to establish an outward church unity, leaving disputed points in scientific theology still open for discussion. At the tercentenary of the Reformation in 1817 a visible union was established, limited, however, at first, as many of its advocates supposed, to a common church government and a common celebration of the Lord's Supper. In this movement the government of Prussia has always been the leader, and the United Evangelical church is the state church there, although dissensions have arisen at various times. A similar union of Lutherans with the Reformed church has been accomplished in several other of the German states; while of the rest some are too exclusively Lutheran, and some too exclusively Reformed to warrant the attempt. In the United States a branch of the United Evangelical church was established near St. Louis in 1840. See German Evangelical Synod of North America; also German Evangelical Protestant Church.

UNITED FREE CHURCH OF SCOTLAND. See Presbyterianism and the Presbyterian Churches.

UNITED IRISH LEAGUE OF AMERICA. An association of Irish-Americans which is practically the successor of the Parnell Land League and of the Irish Federated Societies in sympathy with the Land League Movement. It was provisionally established in New York, Dec. 4, 1901, and was ratified at the first National Convention of the United Irish League held at Boston, Oct. 20–21, 1902. Its purpose is to act as an auxiliary in America to the national organization in Ireland to secure its aims. These include self-government for Ireland, the abolition of landlordism there, and other reforms of political and economic conditions. Membership in the league is open to all Irish-American Nationalists without distinction of class or creed, and to all sympathizers with the national claims of Ireland. The general management of the league when not in convention is vested in a national committee, consisting of the president, two vice presidents, treasurer, and secretary, and 31 members at large. The national convention is held biennially or oftener at the discretion of the national committee.

UNITED IRISHMEN, Society of. An Irish revolutionary society founded in 1791. It was an outgrowth of the sentiments inspired in Ireland by the French Revolution, which found earliest acceptance among the Presbyterians of Ulster, especially Belfast. Its object was to obtain complete political emancipation of both Catholics and Dissenters and to reform the Irish Parliament. It soon spread among the Catholics of the south, and even members of the Established church joined the movement. The government in 1783 passed the Relief Act in the Irish Parliament. This gave the suffrage to Catholics, but did not qualify them for office. An attempted measure of parliamentary reform was, however, rejected in 1794, and the recall of Lord Fitzwilliam removed hopes of reform through parliamentary means. The society then became more revolutionary, collected arms and became to all intents and purposes a military organization. It promised confiscation of the land of hostile landlords to the peasants and sent emissaries to France for aid. Its numbers were greatly increased in the south by the action of the Orangemen of Ulster (Peep o' Day Boys) in expelling the Catholic inhabitants, who were forced to find refuge in the south. In 1796 Wolfe Tone (q.v.), the chief agent in the organization of the society, was sent to France for military aid, and an expedition of 15,000 troops under the command of Hoche (q.v.) was fitted out. A violent tempest prevented the French from landing and the expedition accomplished nothing. The society, nevertheless, remained ready for an invasion. Two directories were established, one in Belfast and the other in Dublin. They were reputed to have 200,000 recruits, but this was certainly an exaggeration. Meanwhile the government resolved to repress the movement before an invasion by France, and under the pretext of repressing disorder the leaders in Ulster were arrested, and the Protestant militia and yeomanry let loose on the population of the south. This irregular force committed great brutalities, it being evidently the intention of the government to incite the peasantry to open rebellion before preparations for a revolution could be completed. The rebellion broke out on May 3, 1798, and was confined to parts of Leinster. As it necessarily assumed the aspect of a religious war, the Presbyterians of Ulster took no part in it. The rebellion was suppressed before the arrival of the French, and shortly afterward Wolfe Tone himself was captured and was sentenced to be hanged but committed suicide. The constitution and oath of the society are printed in Plowden, *History of Ireland*, vol. iii (Philadelphia, 1806). Consult also *The Proceedings of the Dublin Society* (Philadelphia, 1795). The most complete work on the subject is R. R. Madden, *The United Irishmen* (Dublin, 1858). For a brief account consult Hassencamp, *History of Ireland* (London, 1888).

UNITED KINGDOM. The United Kingdom of Great Britain and Ireland is a constitutional monarchy, consisting of the islands of Great Britain and Ireland and various smaller adjacent isles, as the Hebrides, the Orkneys, the Shetlands, the Scilly Isles, Anglesey, and the Isle of Wight. The term "Great Britain" is often used to designate the United Kingdom, as is also the term "England" when the government rather than the country is in mind. The island of Great Britain, the largest island of Europe, with an area of 88,746 square miles, is divided into England (50,874 square miles), Wales (7466 square miles), and Scotland (30,406 square miles). Politically the Scilly Isles and the Isle of Wight are part of England, Anglesey of Wales, and the Hebrides, Orkneys, and Shetlands of Scotland; their areas are included in the figures just given. The area of Ireland is 32,586 square miles. Thus the area of the United Kingdom is 121,331 square miles. The island of Great Britain lies between lat. 50° and 60° N. and is surrounded by the Atlantic Ocean or some of its divisions—the North Sea, English Channel, St. George's Channel, and Irish Sea.

Topography. The seas surrounding Great Britain are very shallow, rarely exceeding 300 feet in depth. The fact that the island stands on the continental shelf has two great advantages: (1) it is protected from the cold waters of the deep Arctic currents and thus is spared the chilling influences of the northern ocean; (2) the shallow surrounding waters are fitted in temperature and in abundant supplies of fish food to support myriads of the best varieties of fish.

The coasts are extremely long in proportion to the area of the land. Great Britain has 1 mile of coast to less than 20 miles of area. England has a coast line nearly 2000 miles in length, while that of Scotland is considerably longer. No part of the island is more than 70 miles from the coast. Two causes have contributed to increase the value of the numerous indentations as harbors. One is the subsidence or depression of the entire western side of the island, causing the sea to form drowned valleys; the other is the rise of the tides all around the coasts, from 6 to 30 feet, which converts the mouths and lower parts of many rivers into deep bays or channels. The deep-sea lochs of the west coast of Scotland are similar in appearance and origin to the fiords of Norway. Here, as on the west coast of England, all the softer rocks have been washed away; and on the Scottish coast there is left an outer barrier of islands and an inner wall of very hard rocks penetrated by these deep fiords. The east coast of Scotland, however, composed mainly of sandstone and clay, has been easily worn into deep estuaries at the mouths of rapid rivers like the Tay; and the east side of England, composed of soft rocks, has been worn into a low monotonous line of shore, broken only by the estuaries of rivers whose current is too sluggish to wear away deep channels. Most of the good harbors are therefore along the west and south shores of the island. The south coast is picturesque, with lofty cliffs and rocky shores dotted with summer resorts.

The highlands and lowlands of Great Britain may roughly be divided into four well-defined areas: (1) the Scottish Highlands, a mountainous and comparatively barren region, lie northwest of a line drawn from Dumbarton to Aberdeen; (2) the Scottish Lowlands, an expanse of fertile lowland, and the Southern Uplands, lie southeast of this line; (3) the mountains of England and Wales lie northwest of a line drawn from Exeter to Berwick; (4) the lowlands of England lie to the southeast of this line.

There are in the Scottish Highlands a number of parallel ranges of mountains, the highest mountain being Ben Nevis (4406 feet), the culminating point of the island. The only passageways are at their extremities. At these extremities are the two roadways through Scotland from south to north, the east coast forming the easiest and most traveled route.

The Scottish Lowlands, which connect the Highlands with the Southern Uplands, are a plain, of the rift-valley type, diversified by many hills of hard igneous rocks, covered with fertile soil, and abounding with natural advantages that have concentrated in them most of the population of Scotland. The Southern Uplands, among which the Clyde rises, are a plateau where the heights are massed into different groups by the rivers that have excavated the valleys.

From the middle of England a broad peninsula (Wales) pushes out towards Ireland. The whole of Wales and the part of England lying to the northwest of the line from Exeter to Berwick are a highland. This hilly and mountainous region is composed of very old sedimentary rocks with masses of crystalline rocks at various centres. Thus the mountains have been partly weathered from the plateau surface into their present forms or were pushed up from below by terrestrial convulsion. The mountains are not so high as those of Scotland. It may be said of the island as a whole that it becomes lower and flatter as it widens out towards the south. The main direction of the mountain ranges of England and Wales is from north to south or from northeast to southwest, and they thus interpose no obstacles to communication with the Scottish Lowlands except among the Cheviot Hills, which, extending along the border, belong to Scotland more than to England and offer an easily protected frontier by which to maintain a separate political existence.

The Cheviot Hills are separated from the Pennine Chain by a low strip between Carlisle and Newcastle. The Pennine Chain is a succession of moors and hills of Carboniferous formation, the latter from 1000 to 2900 feet high, the backbone of northern England, extending south 150 miles and forming the water parting between east and west flowing rivers. The Cumbrian group of mountains, a region also known as the English Lake District, is in the northwest of England and is joined to the Pennines by the high moorland of Shap Fell. This ring of peaks, rising to over 3000 feet, is in its scenic aspects the grandest and most beautiful part of England. Its deep valleys have been eroded from the original high plateau of igneous and old sedimentary rocks, and in these valleys are the long narrow lakes that have made this district famous for its picturesque charm. The Welsh or Cambrian mountains, in which the Welsh tribes were long able to maintain an independent and separate existence, cover Wales and are mostly of very old sedimentary strata with crystalline rocks at various points. Unlike the Scottish Highlands, these mountains do not impart great ruggedness to the coast, because the rivers have brought down vast quantities of sediment, spreading it out into delta plains and largely filling the fiords that formerly existed. The high peninsula of Devon and Cornwall, forming the extreme southwestern extension of England, is the fifth and last feature of the highlands of South Britain. It is separated from Wales by the Bristol Channel, while another great depression on the south, the English Channel, severs it from Brittany, France, with which it is closely related in its crystalline and primary rocks, its high unfertile moorland, and its climate.

To the southeast of this great highland region extend the fertile lowlands of England, a coastal plain, less than 500 feet above sea level as a rule, comparatively flat, composed of younger sedimentary (Mesozoic and Tertiary) rocks, the harder of which stand above the general level, forming several bands of higher ground, the oölitic and chalk bands being most prominent. The oölitic belt of higher ground extends to the northeast from Portland Bill in the south to Whitby in the north, forming, among the various elevations, the Cotswold Hills and the North Yorkshire moors, the latter (nearly 1500 feet in height) being the loftiest part of the plain region of England. Directly east of this Jurassic formation and extending parallel with it is the chalk country, whose ridges of hills form the Salisbury plateau, the Chiltern Hills, and other elevations. These chalk heights also extend along the south of England (the North and South Downs), and are seen in the white cliffs fronting the English Channel and abutting on the North Sea in the North and South Forelands. Between the North and South Downs the weald, a dissected dome, once heavily wooded, wedge-shaped, penetrates westward from the North Sea; and between the north-extending chalk lands and the North Sea extends the London Basin, low, remarkably fertile, whose coast is broken by several estuaries, among which that of the Thames is most prominent. One more distinctive feature, about midway on the east coast of England, is the marshy expanse of the Fenland, almost at the level of the sea.

Hydrography. The water parting is situated much nearer the west than the east coast, with the result that the larger number of rivers flow to the east; with the exception of the western Severn, the eastern rivers are the longest, and their basins larger than the western basins. As the eastern rivers of England flow sluggishly down the gentle slope of the coastal plain and drain the leeward slopes, it is natural that they should be least liable to floods and most important for navigation. Their value for commerce is somewhat impaired, however, by the fact that, crossing the softer rocks of the plain, they carry down a great deal of alluvium with which their mouths are often seriously clogged. The Tyne, Wear, and Tees of northeastern England have a course of only 70 or 80 miles, and their commercial importance depends upon the great coal fields (Tyne and Wear) and the iron and salt deposits (Tees) near them. The basin of the Humber embraces 10,000 square miles, from the mineral beds of the Pennine slopes through the rich agricultural plains; the Aire, Ouse, Trent, and other tributaries help to make it one of the most useful river systems in England. The Thames rises only 300 feet above the sea, but it has a long course of about 200 miles. Its sluggish current, its well-protected estuary, and the tides which carry numerous ocean vessels 50 miles up to London Bridge, help to make the Thames one of the largest commerce carriers among the world's rivers. The important western rivers of south Britain are limited to the Severn and the Mersey. The Severn is the longest British river (nearly 250 miles), with tides of extraordinary height, and empties through one of the largest and richest coal fields in Europe. It is navigable for a long distance and is a great commerce carrier. The Mersey is a short river, rising on the Pennine slopes and obstructed at its mouth by a shifting bar, but its proximity to a rich coal field and to the great manufacturing district of England gives it immense importance in commerce. The western rivers of Scotland, excepting the Clyde, are only short, torrential, and commercially valueless streams; but the Clyde, artificially widened and deepened in its lower part at enormous expense, is the most important river in Scotland, and all the industries of the Lowlands and Southern Uplands—agricultural, mineral, and manufacturing—are represented in its trade. With this exception the longer and more gently flowing eastern rivers are most useful. The Tay, Spey, and Tweed are all about 100 miles, and the Dee and the Don about 80 miles long. The Tay and the Forth are great water highways, commanding all the river traffic passing through the eastern-central portion of Scotland. The two famous lake regions of Great Britain are in the Highlands of Scotland, where here and there in the valleys the rivers have spread out into long and narrow lakes, or lochs, which follow the curves of the hillsides and contribute much to the beauty and charm of this picturesque region, and the Lake District of the Cumbrian Mountains in northwest England, already mentioned.

Climate. Warm winters, cool summers, and large rainfall are the characteristics of the British climate. The island of Great Britain owes these advantages to the surrounding seas, which are unusually warm considering their latitude. The westerly winds (the southwest antitrades, or westerlies), blowing most of the time from off the broad expanse of the Atlantic, moderate the temperature of the winter months, mitigate the heat of summer, and cover the skies for a great part of the year with clouds which often hang upon the land as fog. Icebound harbors are unknown. There is no great variety of climate, because the country is not of great extent, and its surface, even to the mountain tops, does not reach a high elevation. The difference of summer temperature between the extreme north and south of the island is about 10 degrees. The copious rains which the westerly winds bring fall largely over the highland regions of the west, which makes them among the richest in rainfall of all parts of Europe; while the plains of the east receive a far smaller quantity of rain. All parts of the country, however, receive sufficient rain for agricultural needs; and the numerous valleys extending southwest and northeast permit the sea air to carry much moisture far inland before it falls as rain. The annual range of temperature is smallest in the west because it is more exposed to the influence of the Atlantic. The western regions have more sunshine than the plains, where cloud and fog are more prevalent. The average temperature of Great Britain for the year is 48° F. with extremes of 53° F. (Scilly Isles) and 45° F. (Shetland). Snow falls on the higher lands and sometimes covers most of the country, but no mountain is so high as to be snow-capped in summer. The islands are exposed to the great cyclonic storms which sometimes sweep in from the Atlantic.

Soils. Soils formed from the immediately underlying rocks are not the most common in Great Britain, and where they are so formed they are usually poor. Thus the hard crystalline rocks of the western mountains yield a comparatively poor soil; and the soil is not very fertile south of the Thames, where the local chalk and flint enter so largely into its composition. The very fertile soils of most of the plains, particularly north of the Thames, are the mixed components of many kinds of rocks ground up by glacial ice, carried a considerable distance and spread over the surface. The rivers also, passing over many varieties of rocks, spread this mixed rock waste along their valleys, and these alluvial soils are very fertile. The soil of Scotland is naturally fertile, aside from mountain districts.

Flora. The native flora of Great Britain is almost identical with that of the neighboring portion of continental Europe; some mainland species, however, do not appear. In early times the island was almost completely covered with forests, but to-day little of the original woodlands remains, and only 3.6 per cent of the surface is covered with forests. The chief native trees are the oak and beech in the lower lands, and the Scotch pine and birch in the high and more northern districts. The great rainfall on the steeper mountain slopes has generally washed away the soil, showing the rock skeleton unrelieved by vegetation. On the gentler slopes of the Scottish and Welsh highlands, little except moss, fern, and heather can grow in the thin soil. All the cultivated plants that thrive in the lower lands have been introduced from the neighboring Continent and America. The mild, moist climate gives a peculiarly rich and fresh aspect to the vegetation. The pastures and hay lands are luxuriant, and the fields look like well-kept gardens.

Fauna. As the British Isles until geologically recent times were an integral part of the Continent, they partake of the general fauna of western Europe and present few differences except such as are due to man. All the larger animals were long ago exterminated (see EXTINCT ANIMALS), or have been preserved only as curiosities on private estates, with the exception of the red deer. Otters, badgers, polecats, and weasels survive free persecution; foxes persist under protection. The hare, squirrel, hedgehog, vole, some wild mice, moles, shrews, and bats nearly complete the list of remaining British land mammals. Seals of two or three species are found on the northern coasts, and the cetaceans of the North Atlantic visit the shores from time to time. Certain common animals of northern and western Europe, such as the reindeer, elk, roedeer, lemming, hamster, etc., have had no place in Great Britain within historic times; neither have several mammals of southern France.

The birds more fully represent the European air fauna, for the British Isles lie upon a path of coastal migration between tropical and northern latitudes. This brings regularly to Great Britain most of the European birds, but some species are exceedingly rare there which occur commonly in the Rhone-Rhine valley. Laws have long afforded protection to all birds, resident or migratory, preserving many species that were formerly threatened with extinction, yet some have been lost. The principal British birds are the raven, hooded and carrion crows, rook, jackdaw, magpie, chough, and jay—the last two becoming very scarce; the starling, the chaffinch, goldfinch, linnet, bullfinch, house sparrow, various buntings, and other seed eaters; the skylark and woodlark, with several related wagtails, pipits, etc.; a nuthatch and several varieties of titmouse, shrike, and waxwing. Thrushes are represented by the nightingale, blackbird, mavis, missel thrush, and redwing—famous songsters; and lesser insect eaters are the two chats, the wheatear, the redbreast, and several small warblers, accentors, wrens, flycatchers, etc. Several swallows are familiar about buildings and river banks, and two or three woodpeckers. The cuckoo, nightjar, swift, and kingfisher, one species each, carry the list to the birds of prey. These include the brown, barn, and several other small owls, with the great snowy owl as a winter visitor. The osprey is rare. Among the falcons are the peregrine, kestrel, gerfalcon, merlin, and pigeon and sparrow hawks. Honey buzzards, kites, eagles, and vultures are seen only at long intervals, when they wander over from the Continent. The buzzards, goshawk, and marsh harrier complete a long list. Fishing birds are represented by cormorants, gannets, etc., on the coast, and by the bittern inland. Waterfowl include tame swans, the wild bernicle, greylag, bean, and pink-footed geese, and a series of ducks to a large degree identical with those of Canada. Four species of typical pigeons include the wild stock of domestic doves and the widespread turtledove. The game birds are the capercailzie, blackgame, red grouse (one of the few birds peculiar to the British Islands), and the introduced pheasant; but sportsmen find a long list of visiting shore birds, most of which are known also in America; while the sea birds are those of the North Atlantic coasts generally.

Fish abound in the four seas about Great Britain, and their capture supports a large maritime population (see *Fisheries*); certain species, as the sole, turbot, and whitebait, are local and of wide repute for excellence. Salmon still ascend the northerly rivers of the Kingdom under legal protection, and trout, grayling, and various fresh-water fishes of interest to anglers are similarly preserved. Oysters and various other shellfish abound and are largely fished for or cultivated for food. Of reptiles, Great Britain contains but four—a small viviparous lizard, a blindworm, a small colubrine snake (*Tropidonotus natrix*), and the adder (*Pelias berus*). Several frogs, two toads, and some newts comprise the amphibians. The insects, mollusks, and lower invertebrates are as numerous and varied as is usual in a mild and moist climate, and have been more thoroughly studied than anywhere else on the globe.

Geology. Great Britain may be roughly classified, from the standpoint of rock formation, into areas older than the coal measures and areas younger. The Highlands in the north and west are the remnants of the very ancient crystalline and sedimentary rock masses that were greatly disturbed in early geological epochs and have since been largely reduced in height and area by erosion. These regions of ancient rocks were subjected to much faulting and folding; and interspersed among them are areas which volcanic outflows, occurring in various ages and as late as Tertiary times, covered with igneous deposits that were also greatly disturbed by dynamical energy. These elevated lands are not marked by sharp and jagged peaks, but the mountains have been worn away into rounded outlines, and among them are interspersed a number of broad, plainlike moors broken here and there by more elevated masses of harder and particularly of eruptive rocks. The Highland regions may be compared in height with the Catskill Plateau and its surmounting elevations.

In sharp contrast with these ancient crystalline, sedimentary, and eruptive masses forming the Highlands are the younger rocks of the Lowlands, the widely distributed Old Red Sandstone of Devonian formation, the chalk and sandstones and the clays of the Carboniferous era. Towards the south and east of the old elevated rock masses are the Carboniferous strata containing the coal deposits which have contributed so much to the material greatness of Great Britain. None of the younger and lower lands has been much affected by faulting and folding. These lower lands extend from the mouth of the Tee to the south of the island, widening with their south extension till they cover the larger part of England, Exeter being their western limit on the south coast. They are mostly flat, trough-shaped, or rolling surfaces of the Triassic, Jurassic, Cretaceous, and Tertiary formations. The greatest diversity of surface and the finest scenery are thus in the north and west, while the lowest and most uniform surface is in the south and east. The extreme south of England escaped glacial action, but elsewhere many of the minor features of the land were produced by the ice sheet and glaciers of the Ice age. In scarcely any other part of the world is there so wide a range of geological strata in so limited an area as in Great Britain; only the broader aspects of the subjects are here indicated.

Minerals and Mining. The industrial history of the United Kingdom and its present position and outlook are intimately connected with the possession and exploitation of unusually abundant resources of coal and iron, particularly coal. They have largely determined the distribution of population (see *Population*) and have made possible the country's highly developed industrial life and extraordinary wealth. There was no mineral production on a large scale until the industrial revolution of the eighteenth and nineteenth centuries. Collieries were first opened at Newcastle in 1238, and the coal was shipped by sea to London and other towns on navigable rivers.

Early in the seventeenth century coal was used in smelting iron, but primitive mining methods, and particularly the lack of means for pumping water out of the mines, limited its use. The inventions of James Watt (c.1770) eliminated this difficulty and greatly increased production, thereby making practicable the blast-furnace method of iron smelting, which had already been introduced but was impeded by insufficient supplies of wood and coal. In the later years of the eighteenth century there was a constant succession of improvements—to wit, in mining, in the manufacture of iron, in internal means of communication—all facilitating increased production of coal and iron. The annual output of coal in the last years of the eighteenth century is estimated to have exceeded 10,000,000 tons. The introduction of the steamboat about 1812 and of the steam railway about 1830 created a new demand for coal and iron and made domestic and foreign distribution more practicable, thus enormously extending the market. Production increased throughout the nineteenth century, the average annual absolute gain continuing undiminished. The value of mining products aside from coal and iron is comparatively small.

The supremacy of Great Britain in total mineral product is the more remarkable since the product includes virtually neither gold nor silver. In 1820 Great Britain's coal production was two and one-half times as much as the rest of the civilized world, and as late as 1840 the iron-ore production was more than all other countries combined. The United States first excelled Great Britain in mineral production in the latter part of the nineteenth century and is constantly increasing its lead. Great Britain's iron output was first surpassed by the United States in 1890 and its coal in 1899. The output of the British iron mines is insufficient for local needs, and increasing quantities, equaling in value that produced at home, are imported, chiefly from Spain; while coal for the whole period has been exported in increasing quantities. The export of coal, coke, and patent fuel increased from 46,098,228 tons in 1900 to 67,035,848 in 1912. Iron being much more easily imported than coal, Great Britain fares better than it would if the status of the production of the two minerals were reversed.

Coal and iron ore respectively have been produced in the United Kingdom as follows: in 1860, 81,000,000 tons and 8,155,000 tons; in 1870, 112,000,000 and 14,606,000; in 1890, 188,000,000 and 14,066,000; in 1900, 225,181,300 and 14,257,344; in 1910, 264,433,028 and 15,226,015. The following table shows for recent years the coal and iron produced in the United Kingdom and their values (in thousands of pounds sterling).

YEAR	COAL		IRON ORE	
	Tons	£1000	Tons	£1000
1895......	189,661,362	57,231.2	....	......
1900......	225,181,300	121,652.6	....	......
1905......	236,128,936	82,038.6	14,590,703	3,482.2
1910......	264,433,028	108,377.6	15,226,015	4,022.3
1913......	287,430,473	145,535.7	15,997,328	4,543.6

About two-thirds of the coal is mined in England, the remainder being almost equally divided between Scotland and Wales. The principal productive districts, beginning at the north, are the Scottish Lowlands, or the neighborhood of Glasgow, the Newcastle district, the two fields on the east and west slopes of the Pennine Range in southwest Yorkshire, and to the southeastward and in eastern Lancashire, the Staffordshire fields farther south, and the South Wales field occupying Glamorganshire and parts of the adjoining counties. The third of these districts has the largest output. The output by districts was as follows in 1912:—in England: Durham, 37,890,404 tons; Yorkshire, 38,298,080; Lancashire, 22,790,472; Staffordshire, 13,698,357; Derbyshire, 16,573,157; Northumberland, 13,381,787; Nottinghamshire, 11,122,832; Monmouthshire, 13,391,742; other districts, 13,685,300;—in Wales: Glamorganshire, 33,727,100; other districts, 6,248,171;—in Scotland: Lanarkshire, 16,624,363; other districts, 22,894,266;—in Ireland, 90,307; total 260,416,338. Iron ore is obtained most abundantly in connection with the coal measures of Yorkshire and other regions. Red hematite ores are obtained in north Derbyshire and in Cumberland.

In mediæval and ancient times in Great Britain other varieties of minerals were relatively of much greater importance than coal and iron. According to tradition, centuries before the Christian era Phœnician merchants visited England and traded in the products of the tin mines of Cornwall. It is certain that the Cornish mines have been worked from a very early period. During the Middle Ages, down to the time when the tin mines of Bohemia and Saxony were discovered, England supplied almost all the tin used in Christendom. Copper and silver were also mined. The revenue from the Devonshire tin and lead mines paid the expenses of the French wars of the fourteenth century. The great modern improvements in transportation have since made it more economical in many cases to import the ore. English clays have always been used in making pottery, especially after the introduction of improved methods by Dutch and Huguenot immigrants. The country's abundant supply of useful stone has always been drawn upon, increasingly so in recent years. In 1912 the total spot value of the metallic minerals produced in the United Kingdom was £5,211,746; of the nonmetallic minerals, £126,009,107; total, £131,220,853. Of the mineral output in 1912, the value of £88,897,556 was raised in England, £23,744,169 in Wales, £18,344,112 in Scotland, and £208,042 in Ireland; included in the total is £26,974, value of minerals raised in the Isle of Man. The following table shows the quantity of metal produced in the United Kingdom, from British ores (and, in the case of pig iron, also from foreign ores), with estimated value at the place of production.

ORE	1901	1906	1912
Pig iron,* tons.....	4,091,908	5,040,360	4,451,636
	£12,826,622	17,623,966	16,419,298
Pig iron,† tons.....	3,836,739	5,143,500	4,299,828
	£12,026,762	17,984,603	15,859,372
Fine copper, tons...	532	749	291
	£37,661	69,385	22,714
Metallic lead, tons..	20,034	22,335	19,154
	£254,599	392,445	349,561
White tin, tons.....	4,560	4,522	5,254
	£556,571	819,377	1,116,738
Zinc, tons.........	8,418	8,539	6,062
	£149,174	235,819	158,622
Silver, ounces......	174,466	148,341	122,998
	£19,764	19,083	14,382
Bar gold, ounces...	6,225	1,871	1,546
	£22,042	6,569	5,103
Total.........	£25,893,195	37,151,247	33,945,790

* From British ores. † From foreign ores.

In 1912 there were 3910 mines in operation, with 1,117,148 persons employed, of whom 895,485 were males working underground, and 215,001 males and 6662 females aboveground. In quarries 79,887 persons were employed.

Fisheries. The natural resources of the United Kingdom include very profitable fisheries. The herring fisheries off the Norfolk coast have always been important and were until the seventeenth century largely in the hands of the Dutch. But as the government fostered the fishing industry, the Dutch were supplanted, and to-day the United Kingdom is equaled only by the United States in the value of its annual catch. The value of the fish (exclusive of salmon) landed on the coasts of the United Kingdom, distinguishing the English, Welsh, Scottish, and Irish coasts, is shown on page 667. The herring fishery is the most important on both English and Scottish coasts. Its principal centre is Great Yarmouth. The North Sea fisheries yield shellfish, mackerel, and codfish. Sardine fishing is of some importance in Cornwall and Devonshire. Oyster fisheries are widely distributed along the coasts. Value for the United Kingdom of the principal catches in 1913: herring, £4,572,295; cod, £2,300,119; haddock, £1,891,005; hake, £678,981; soles, £474,127; whiting, £390,980; turbot, £302,411; skates and rays, £292,972; mackerel, £230,161. On English and Welsh coasts plaice were landed to the value of £1,051,016. At the end of 1912 there were registered in the United Kingdom 24,012 boats as engaged in fishing, giving employment to 98,894 persons, but there was also a large number of small craft not registered. In recent years the general tendency towards centralization in important industries has been very evident in the fishing industry, and the population engaged in fishing has centred to a large extent at a few important points, especially Great Yarmouth, Grimsby, Hull, and Peterhead.

1900	England and Wales	Scotland	Ireland	United Kingdom
Fish, wet..	£6,610,268	£2,325,994	£306,229	£9,242,491
Shellfish...	334,882	75,906	61,426	472,214
Total...	£6,945,150	£2,401,900	£367,655	£9,714,705
1913				
Fish, wet..	£10,009,326	£3,925,360	£294,625	£14,229,311
Shellfish...	327,363	72,357	63,922	463,642
Total...	£10,336,689	£3,997,717	£358,547	£14,692,953

Agriculture and Stock Raising. Compared to other industries agriculture is of far less importance in the United Kingdom than in any of the other great nations. The fact that the country is not producing sufficient food to supply its own needs makes the question of food provision one of great importance. It is less fortunate than its European neighbors as regards natural facilities for agriculture, having a smaller cultivable area and a soil of only moderate fertility. At one time an exporter of food products, the decline of the country's agriculture dates from the latter part of the eighteenth century, and though protected for a while by high import duties the repeal of the Corn Laws of 1846 opened the British market to foreign competition.

AREA, CROPS, ETC.	Great Britain			Ireland			United Kingdom		
	1895	1905	1912	1895	1905	1912	1895	1905	1912
Cultivated area.....	32,577,513	32,286,832	31,996,024	15,179,382	15,262,949	14,673,778	47,883,797	47,673,115	46,793,747
Corn crops:									
Wheat...........	1,417,483	1,796,995	1,925,737	36,532	37,860	44,855	1,456,045	1,836,598	1,971,801
Barley or bere....	2,166,279	1,713,664	1,648,201	171,789	154,645	165,367	2,346,371	1,872,305	1,816,426
Oats.............	3,296,063	3,051,376	3,029,054	1,216,401	1,066,806	1,046,000	4,527,930	4,137,406	4,096,111
Rye..............	68,713	62,197	60,943	11,520	10,155	7,765	80,296	72,480	68,779
Beans............	242,665	254,765	285,989	2,355	1,471	1,421	245,129	256,383	287,511
Peas.............	209,024	175,235	202,319	497	253	279	209,608	175,624	202,742
Total..........	7,400,227	7,054,232	7,152,243	1,439,094	1,271,190	1,265,687	8,865,379	8,350,796	8,443,370
Green crops:									
Potatoes..........	541,217	608,473	612,671	710,486	616,755	595,184	1,262,863	1,236,768	1,219,583
Turnips and swedes	1,915,902	1,589,273	1,512,535	313,281	282,105	271,771	2,237,686	1,879,384	1,792,523
Mangold..........	334,861	404,123	488,486	53,027	72,570	‡81,700	388,442	477,540	¶571,451
Cabbage, kohl-rabi and rape.......	153,053	179,226	173,538	45,286	45,695	41,060	198,488	225,315	215,346
Vetches or tares...	165,804	136,429	137,420	4,250	2,566	2,008	170,371	139,285	139,748
Other crops......	114,925	159,518	190,854	25,424	24,682	30,366	142,271	186,082	223,474
Total..........	3,225,762	3,077,042	3,115,504	1,151,754	1,044,373	1,022,089	4,400,121	4,144,374	4,162,125
Flax..............	2,023	441	811	95,203	46,158	54,931	97,226	46,599	55,742
Hops..............	58,940	48,967	34,829	......	......	......	58,940	48,967	34,829
Small fruit.........	74,547	78,825	85,141	......	4,531	§15,218	74,920	83,941	** 100,747
Bare fallow........	475,650	349,313	280,746	18,431	4,195	......	494,430	353,742	281,231
Clover, sainfoin, and grasses under rotation:									
For hay..........	2,303,431	2,189,286	1,978,501	635,586	628,635	‖916,976	2,952,619	2,831,305	2,908,233
Not for hay......	2,426,370	2,228,232	2,012,528	649,792	626,478	‖1,713,519	3,108,541	2,948,018	3,760,468
Total..........	4,729,801	4,477,518	3,991,029	1,285,378	1,255,113	2,630,495	6,061,160	5,779,323	6,668,701
Permanent pasture: *									
For hay..........	4,760,889	4,688,520	5,108,269	1,558,890	1,665,871	‖1,570,373	6,328,052	6,361,439	6,684,945
Not for hay......	11,849,674	12,511,974	12,227,452	9,630,632	9,971,518	‖8,114,985	21,503,569	22,503,934	20,362,057
Total..........	16,610,563	17,200,494	17,335,721	11,189,522	11,637,389	9,685,358	27,831,621	28,865,373	27,047,002
Orchards †..........	218,428	244,323	246,527	....	....	....	....	....	....

* Exclusive of heath or mountain land.

† Arable or grass land used also for fruit trees.

‡ Inclusive of beetroot.

§ Including orchards.

‖ The large apparent change in area is chiefly due to greater care and to a different method in classification.

¶ Inclusive of Irish beetroot.

** Inclusive of Irish orchards.

Foreign competition has caused a complete change in agricultural methods. A decided decrease in the production of grains, particularly of wheat, was followed by an increase in market gardening and the pastoral industries. The distribution of crops varies within the different sections, being determined largely by physical conditions. Mountainous districts in north and south Scotland, in western England, and in a large portion of Wales are unavailable for tillage, while there are extensive lowlands and swampy regions, which even with extensive drainage have not been entirely brought under cultivation. The subjoined table shows, according to British agricultural statistics, the total area in acres (including rivers and lakes, but not including foreshore and tidal waters) and the total cultivated area in Great Britain, in

YEAR	Great Britain	Ireland	United Kingdom
Total acres..........	56,804,166	20,734,124	77,724,044
Cultivated, 1900....	32,437,386	15,234,693	47,795,120
" 1910....	32,145,930	14,661,045	46,931,637
" 1912....	31,927,301	14,691,147	46,740,904

Ireland, and in the United Kingdom, including the Isle of Man and the Channel Islands.

The share of England, of Wales, and of Scotland in the total cultivated area of the island of Great Britain is shown below.

LAND	England	Wales	Scotland
Total acres*........	32,559,355	4,778,182	19,459,584
Cultivated, 1886–90 .	24,960,192	2,842,616	4,895,715
" 1905....	24,611,186	2,794,661	4,880,985

* The figures here given do not exactly agree with the total for Great Britain in the preceding table on account of differing official calculations.

The area in acres under the principal crops, in the first week of June, is reported on page 667 (figures for the United Kingdom include those for the Isle of Man and the Channel Islands).

The true significance of British agriculture is not shown so much by the acreage as by the yield per acre. Intensive cultivation, application of modern scientific principles, and the liberal use of natural and artificial fertilizers cause the reluctant soil to produce unsurpassed quantities. Thus, while the area of cultivation has remained practically stationary, the product has constantly increased. (See ENGLAND; IRELAND.) The production of principal crops in Imperial bushels, long tons, or hundredweights, and the average yield per acre in 1912, were officially estimated for Great Britain and for Ireland as follows.

CROPS	GREAT BRITAIN		IRELAND	
	Production	Per acre	Production	Per acre
In bushels:				
Wheat.........	55,838,360	29.00	1,563,942	34.87
Barley and bere.	51,238,728	31.09	6,968,470	42.14
Oats..........	109,935,064	36.29	54,865,569	52.45
Beans.........	7,724,640	27.63	59,405	41.81
Peas..........	3,916,680	22.55	7,814	28.01
In tons:				
Potatoes.......	3,179,632	5.19	2,546,710	4.28
Turnips and swedes.......	20,278,639	13.41	3,783,218	13.92
Mangold.......	8,836,718	18.09	‡1,301,048	‡ 15.92
Hay*..........	2,675,208	1.35	1,701,027	1.86
Hay†..........	6,343,423	1.24	3,295,564	2.10
In hundredweights				
Hops..........	373,438	10.72	....	....

* From clover, sainfoin, and grasses under rotation.
† From permanent pasture.
‡ Inclusive of beetroot.

Great Britain has originated many of the finest breeds of stock (see ENGLAND; SCOTLAND), the purity of which is zealously guarded. It is a noteworthy fact that the United Kingdom has more than half, and Great Britain almost exactly half, as many sheep as are found in the United States. The following table shows the number of live stock in the first week of June, 1912, and, for the United Kingdom, in 1900 (the figures for horses include only horses used for agriculture, unbroken horses, and brood mares).

STOCK	Great Britain	Ireland	United Kingdom 1912 *	United Kingdom 1900 *
Horses..	1,441,023	544,332	1,994,607	2,000,415
Cattle ..	7,026,096	4,848,498	11,914,635	11,455,009
Sheep...	25,057,732	3,828,829	28,967,495	31,054,726
Swine...	2,655,797	1,323,957	3,992,549	3,663,716

* Including Isle of Man and Channel Islands.

In June, 1913, horses numbered 1,874,264; cattle, 11,936,600; sheep, 27,629,206; swine, 3,305,771.

The following figures show the distribution of live stock in the three divisions of Great Britain and in Ireland in 1905.

STOCK	England	Wales	Scotland	Ireland
Horses....	1,204,124	161,923	206,386	534,875
Cattle.....	5,020,936	738,789	1,227,295	4,645,215
Sheep.....	14,698,018	3,534,967	7,024,211	3,749,352
Swine.....	2,083,226	211,479	130,214	1,164,316

The characteristics of British land ownership and tenure are, briefly, centralization of ownership, capitalistic tenants who pay money rent on long-time tenures, and a large laboring class who are on a low economic and social plane. Primogeniture has kept the large estates intact, and in 1876 two-thirds of the entire landed property of England and Wales was owned by about 10,000 individuals. In Scotland, in 1871, 42.1 per cent of the total area was owned by only 68 persons. The status with regard to ownership in Great Britain has not greatly changed, although some tendency in late years is to be noted among the agricultural laboring class to acquire small holdings as provided by recent parliamentary enactments.

Cultivation is in the hands of tenants, and renting therefore is well-nigh universal, as will be seen from the following table, giving the number of acres under crops and grass occupied by tenants and owners in 1912.

DIVISIONS	By tenants	By owners	Total
England.............	21,733,533	2,680,960	24,414,493
Wales...............	2,486,666	273,531	2,760,197
Scotland............	4,346,209	475,125	4,821,334
Great Britain......	28,566,408	3,429,616	31,996,024

Details of holdings of one acre and upward for 1912 are shown below, with average size in acres of holding in that year and in 1895.

DIVISIONS	No. of holdings	Cultivated acreage	Average size	
			1912	1895
England.............	374,809	24,414,493	65.1	65.3
Wales...............	61,077	2,760,197	45.1	47.1
Scotland............	77,662	4,821,334	62.0	61.5
Great Britain......	513,548	31,996,024	62.3	62.6
Ireland.............	521,345	14,673,778	28.1	*29.5

* 1896 figures.

The various sizes of these holdings in 1912 are shown in table on page 669.

While the average size of farms is comparatively small, the intensive cultivation makes the use of capital, machinery, etc., an economic advantage. The long-term renting system, where the tenancy often descends in the same family for generations, induces the farmer to improve his land rather than to exhaust it. By the Agricultural Holdings Acts of 1875 the tenant secures compensation for whatever improvements he has placed on the land at the end of his tenancy. Laws passed in 1882, 1887, 1890, 1892, and 1894 provided that under certain conditions a demand in any locality for small holdings, either for rent or ownership, might be secured legally by compulsion if necessary. Under the Small Holdings and Allotments Act of 1908 and the Irish Land Act of 1903 the prospects of the agricultural laborer have been improved, and under the latter Act state advances are made to the tenants to purchase their holdings.

DIVISIONS	1–5 acres	5–50 acres	50–300 acres	Over 300 acres
England..............	81,884	168,038	110,657	14,230
Wales..............	10,314	32,484	17,937	342
Scotland..............	17,778	34,088	23,151	2,645
Great Britain......	109,976	234,610	151,745	17,217
Ireland..............	62,266	367,779	*81,980	†9,440

* 50–200 acres. † Over 200 acres.

Manufactures. Until the recent industrial development in the United States no other nation had for more than a century approached Great Britain in the amount of manufactured products. But in the earlier periods of the nation's history manufacturing was of minor importance and did not begin to equal that of the Dutch, the Flemish, or the French. Chief among the factors which have brought Great Britain up from industrial insignificance to its present prominence are (1) its comparative freedom from wars, (2) its early superiority as a wool producer, (3) the favorable climate, (4) great abundance of coal and iron, (5) preeminence of shipping interests and the acquisition of territorial possessions in extending markets, and (6) improved methods and labor-saving inventions.

GROUP OF TRADES	Value of products	Value of materials used	Horse power of machinery	AVERAGE PERSONS EMPLOYED	
				Wage earners	Total
Mining and quarrying..............	£148,026,000	£28,495,000	2,495,134	947,178	965,230
Iron and steel, engineering, and shipbuilding..............	375,196,000	212,224,000	2,437,481	1,432,489	1,539,415
Metal, other than iron and steel..............	93,456,000	81,341,000	83,974	101,687	114,473
Textile..............	333,561,000	235,038,000	1,987,765	1,210,777	1,253,044
Clothing..............	107,983,000	58,185,000	84,806	681,305	756,466
Food, drink, and tobacco..............	287,446,000	197,734,000	380,171	400,617	463,701
Chemical, etc..............	75,032,000	53,466,000	214,770	110,107	127,842
Paper, printing, stationery, etc..............	61,308,000	26,611,000	237,573	287,222	325,475
Leather, canvas, and India rubber..............	34,928,000	26,229,000	54,891	75,666	84,724
Timber..............	46,390,000	24,780,000	173,813	214,764	239,195
Clay, stone, building, and contracting..............	116,692,000	49,679,000	433,279	674,579	725,240
Miscellaneous..............	8,288,000	3,778,000	9,417	42,132	46,874
Public-utility services..............	77,051,000	30,786,000	2,059,737	313,800	342,491
Total..............	1,765,366,000	1,028,346,000	10,653,811	6,492,323	6,984,170

From a very early period Great Britain far excelled other Northern European countries in the production of wool. Edward III, near the middle of the fourteenth century, took advantage of internal troubles in Flanders and secured the migration of a considerable number of Flemish artisans to England. The woolen industry grew apace, centred chiefly in the towns of east England, but was not supreme until the Elizabethan period. The wars and persecutions on the Continent and the welcome by the English authorities resulted at this time in a great influx of Flemings, who not only gave a great impetus to the old industry, but introduced new ones, such as silk weaving, the manufacture of cutlery, cloak making, and the manufacture of hats and pottery. A century later the revocation of the Edict of Nantes (1685) led to the emigration to England of a large number of French Huguenots, representing the most skilled artisans of France. In the latter part of this period manufacturing industry, which had early spread well over the east and west of England, developed extensively in the long-desolated region of the north.

Then came the great industrial revolution beginning in the latter half of the eighteenth century, due largely to the mechanical inventions which affected practically every branch of the manufacturing industry. (See INDUSTRIAL REVOLUTION.) The use of machinery, and especially its necessary installation in a single plant under the application of steam power, led to the factory system and the almost complete overthrow of the old domestic system.

Very significant, too, were the resulting changes in the location of the weaving industry. The textile machines were at first generally propelled by water power. The north region—Yorkshire and Lancashire—afforded superior facilities of this kind and consequently enjoyed a remarkable increase in textile manufacturing at the expense of the old centres farther south. Similarly the coal resources of the same region drew the iron manufacturing away from Suffolk and Norfolk when coal supplanted wood as a fuel. Birmingham, which had formerly depended upon the neighboring forests of Arden for the fuel used in its smelting industry, was fortunately near enough to the new coal fields to place it at a great industrial advantage, and it has remained the largest centre of the iron industry. When steam power supplanted water power in the textile industries, the factories were no longer compelled to locate upon the streams and along watercourses. But as the coal supply was in the same district and the industry was otherwise favored there, as has been pointed out, it continued to develop in the north of England. Improved methods were applied first to manufactures of cotton and subsequently to woolens and linens.

The value of the annual cotton manufactured product in the United Kingdom was 100 times greater at the end of the nineteenth century than at the beginning. Before 1850 it had surpassed wool. The value of the annual woolen product was three, and linen five, times as great at the end as at the beginning of the century. Some idea of the importance of these two products may be gathered from the figures of the increase of their exportation. (See under *Commerce.*) Lancashire is the largest centre of the cotton industry. Glasgow is another important centre. The woolen industry is largely confined to west Yorkshire. Both Ireland and Scotland exceed England in the production of linen. (See ENGLAND; SCOTLAND.) The manufacture of machines and metal ware is centred principally in north England, the different branches of this industry being largely localized in special districts. (See ENGLAND.) The Clyde district of Scotland leads the world in the building of ships. (See SCOTLAND.) Scotland and Ireland are noted for the manufacture of whiskies, and England has a very large brewing industry. (See ENGLAND; IRELAND; SCOTLAND.) The table on page 669 is a summary of the census of production of 1907. See also FRIENDLY SOCIETY; TRADE-UNIONS.

Transportation and Communication. Prior to the industrial revolution (see *Manufactures*) inland transportation was much inferior to that in other European countries. As early as 1423 the English government began the improvement of the Thames River and other natural watercourses for purposes of navigation. The latter part of the eighteenth and the early part of the nineteenth century were periods of remarkable development in the construction of canals, then industrially important. With the advent of railroads the canals were partly superseded. However, the ship canals are quite important, as the largest and most famous of which, the Manchester Ship Canal, from Manchester to the Mersey port of Liverpool, was only completed in its present form in 1894. The Gloucester and Berkeley and the Exeter canals are also ship canals of some importance, and the Thames, Severn, Aire, and Weaver rivers are canalized. Bearing this and the insularity of Great Britain in mind, its inland shipping facilities are remarkable. In 1915 there were about 4700 miles of canals in the United Kingdom, of which 3640 were in England and Wales. The tonnage carried in 1905 amounted to 43,161,927.

Another method of meeting the demands of a growing industry upon transportation was the turnpike. Tramways have since about 1700 been used at the mines, and about 1800–05 one was constructed from Wandsworth to Croydon and Reigate. Shorter ones were completed in other parts of the country. Finally, in 1825 a railway line that was operated by steam, 14 miles in length, was opened for passenger traffic from Stockton to Darlington. The first important railway line in the world, that from Liverpool to Manchester, was opened in 1830. (See RAILWAYS.) The mileage for the United Kingdom in 1850 was 6620; in 1870, 15,540; in 1900, 21,855; in 1912, 23,441. Of the last amount 16,223 miles were in England and Wales, 3815 in Scotland, and 3403 in Ireland. London is the focal point for the principal lines of England. The increase in the number of passengers conveyed (exclusive of season-ticket holders) is indicated in the table in the next column.

In 1905 the tonnage of minerals conveyed was 358,076,000, and of general merchandise 103,063,000; in 1912, 401,564,000 and 118,715,000. The combined capital of all the railways greatly exceeded the national debt in amount. In 1912 the total gross receipts of the railways of the United Kingdom were £128,553,417; working expenses, £81,224,343; net receipts, £47,329,074; proportion of working expenditure to gross receipts, 63, as compared with 62 in 1905 and in 1900. There are many small lines, but these are nearly all operated by one of the large companies. Of these, the Great Western has the greatest mileage, the largest tonnage of goods is booked by the North Eastern, and the largest number of passengers is carried by the Great Eastern. Parliament recognizes nothing in the nature of a vested interest as attaching to railways, and privileges granted may be withdrawn when they cease to be consistent with the general advantage. No official step has been taken towards government ownership. A railway commission of three members has final decision in questions of fact that arise in the administration of the railways. Their decisions on questions of law are subject to appeal.

YEAR	England and Wales	Scotland	Ireland
1862	152,437,000	17,610,000	10,436,000
1880	540,669,000	45,956,000	17,259,000
1900	992,426,000	122,201,000	27,650,000
1905	1,054,416,000	115,580,000	29,026,000
1912	1,161,993,000	103,182,000	29,162,000

Curiously enough, the tramways, which, as we have seen, antedate the railway, went into disuse when the railways developed, and it was only about 1870 that they were successfully reinstated in the form of street railways, on the model of the American system. They have not yet become nearly so common as in the United States, carriage transportation still being mainly depended upon in the cities. In 1905 the mileage of tramways and light railways in the United Kingdom was 2177, about two-thirds belonging to local authorities; in 1912, 2642. The necessity for some means of rapid transit to meet the needs of agricultural and other interests not served by the regular system of railway transportation resulted in the construction of light railways during 1885–1900. The greater part of these lines are modeled after the ordinary railway, while the remainder are nearer to the type of the American interurban street railways.

The United Kingdom has highly efficient postal and telegraph services, both of which are in the hands of the government. The postal system was revolutionized by laws of 1837 and 1839, the penny postage for letters being established in 1839. The revenue from the postal service exceeds the expenditure by nearly £5,000,000 annually. A parcel post, run in connection with the post-office system, has largely supplanted private express companies in the carrying of light packages to all parts of the Kingdom. Postal savings banks and a system of life insurance are connected with the postal system. (See *Savings Banks.*) During 1868–70 the government assumed the ownership and control of all telegraph lines in the United Kingdom and made them a part of the post-office system. The charges for service were greatly reduced, with a consequent enormous increase in the number of messages sent. Telegrams may be sent to any part of the United Kingdom for 6d. for the first 12 words and 1 halfpenny for each additional word. The operation of the telegraph service creates a large deficit each year.

The government also developed the policy of purchasing and controlling the telephone lines as a part of the post-office system. During 1892–

97 all the main lines were acquired, but a private company still had a monopoly of the local or town lines. In 1899 the government began to compete with the lines inside the towns, and on Jan. 1, 1912, took over these lines, which had been amalgamated into the National Telephone Company. Great Britain is connected with Ireland by a large number of submarine cables and thence with America, and there are several cables connecting with the continent of Europe.

Commerce. The industrial supremacy which the United Kingdom has so long enjoyed has probably been most manifest in its commerce. The protection and expansion of trade are the hopes of the British manufacturer and are the secret of British colonial expansion and zeal in maintaining a naval supremacy. In acquiring and maintaining this position Great Britain has perhaps more natural conditions in its favor than any other country. An island off the west coast of Europe, it was free from the disturbing international conflicts that afflicted continental trade centres. The importance of its strategic central position increased with the growing commercial importance of the Western Hemisphere. Again, Great Britain has been favored by her coast line. She is favored also by her abundant natural resources, the energy, ingenuity, and perseverance of her people, her democratic institutions, and the activity of the government in fostering and protecting trade interests.

The supremacy of English commerce is, however, of comparatively recent times. Until the reign of Queen Elizabeth the trade of England had been almost wholly in the hands of foreigners. The fostering of English commerce and shipping was one of the expedients devised to help in the acquisition of precious metals; for, according to the mercantilists of that era, increase in trade would result in the natural inflow of metals. Trading companies were encouraged by the granting of monopolies. Though at this stage competition in both East and West was very great, England succeeded in extending its trade, the total for imports and exports increasing from £4,628,000 in 1613 to £12,428,000 in 1699. Out of trade rivalry grew the Navigation Laws of Cromwell and subsequent acts, which tended to limit colonial trade to English or colonial vessels and greatly restricted colonial manufactures with a view to fostering English trade and shipping interests and extending the market for English goods. The policy operated with great severity against both Scottish and Irish trade and industries. The union of Scotland with England in 1707 and the establishment of free trade between the two greatly benefited British commerce. Through the wars of the eighteenth century Great Britain extended its colonial territory and thereby broadened its markets. From 1782 to 1792 the trade increased in value from £23,300,000 to £44,500,000, and by 1810 it had reached a value of £82,870,000. In 1780 the East Indian trade formed but one thirty-second part of the total foreign trade; but after the abolition of the monopoly feature of the rights of the East India Company as applied to India in 1813 and later in China, this commerce rapidly increased.

Commercial treaties tending towards free trade were concluded with various powers, and finally (1846) an out-and-out free-trade policy was adopted. The development of the commerce of the United Kingdom during the last half century is indicated in the following table, which shows total imports of merchandise; net imports, i.e., total imports less reëxports; exports of United Kingdom produce and of foreign and colonial produce; and total exports of merchandise.

YEAR	IMPORTS		EXPORTS		
	Total imports	Net imports	United Kingdom produce	Foreign and colonial produce	Total exports
1862	£225,716,976	....	£123,992,000	£42,175,000	£166,168,134
1880	411,229,565	....	223,060,000	63,354,000	286,414,466
1895	416,689,658	....	226,128,246	59,704,161	285,832,407
1900	523,075,163	£459,893,405	291,911,996	63,181,758	354,373,754
1905	565,019,917	487,240,004	329,816,614	77,779,913	407,596,527
1910	678,257,024	574,495,979	430,384,772	103,761,045	534,145,817
1913	768,734,739	659,159,702	525,245,289	109,575,037	634,820,326
1914	696,635,113	....	430,721,357	....	526,195,523

From this it will be seen that the imports were increasing faster than the exports. The United Kingdom had the largest imports and exports in the world, Germany and the United States standing next.

Prior to the reign of Elizabeth wool constituted the bulk of English exports, while manufactures of wool and other products constituted most of the imports. But soon England became a shipper of wool manufactures, and these became the leading export. Later, with the great development in sheep raising in British colonies, wool came to be extensively imported, and the manufactures and exports thereof greatly increased. The exports of woolen and worsted manufactures and yarn amounted to £31,386,355 in 1906 and £37,773,504 in 1912. Cotton manufactures did not figure among exports before the industrial revolution. But in 1802 they exceeded the exports of woolen goods and rapidly increased until they were three times the value of the latter and made up the largest single item of exportation; in 1906 the exports of cotton yarn and manufactures amounted to £99,598,915 and in 1912 to £122,219,939. Raw cotton likewise became the greatest item of importation. At first cotton was obtained from Brazil and the West Indies, but during the nineteenth century the bulk of it was supplied by the United States, although Egypt now shares largely in the supply. Cotton imports from India, which became prominent during the Civil War in the United States, are now of minor importance. (See INDIA.) About 1800 the exports of metal products were still small, but they rapidly increased. In 1907 the exports of iron and steel and their manufactures amounted to £46,563,386 and in 1912 to £48,597,677; hardware, cutlery, etc., in 1912 amounted to £8,108,878; and machinery in 1907 to £31,743,253 and in 1912 to £33,158,015. As British iron mines become more difficult to work, and superior ores are found elsewhere, imports of iron ore may be expected to increase. Imports of iron ore and scrap in 1912 were valued at £6,219,050. The aggregate of other metals exceeds iron in import value, but is much less in export value. The value of coal exports doubled during 1891–1900, being £36,409,614 in 1900 and ranking next to cotton manufactures. The coal export declined in value to £24,859,129 in 1905 and then rose to £40,494,274 in 1912.

The preponderating increase of British imports over exports is due largely to the returns from the enormous foreign investments and the profits accruing from the carrying trade. The imports of grain and flour increased in value from about £34,000,000 in 1870 to £69,200,285 in 1905 and £88,496,284 in 1912. Of the grain articles wheat constituted over half the total in 1912, about one-half of which was from the United States. Corn is next in importance. The imports of meats and animals for food amounted to £49,431,748 in 1905 and to £49,079,559 in 1912. Sugar originally came almost wholly from England's West Indian possessions, but the bounty-produced beet sugar of the Continent has taken its place. Tea, wheat, and jute are the principal imports from British India, and wheat and lumber from Canada. Gold is the leading import from the British South African possessions, and it is also extensively imported from Australia.

The following table shows the value of merchandise consigned from and to foreign countries and British possessions in 1904 and 1912, in thousands of pounds sterling; imports for consumption, or net imports, are discriminated from total imports, and domestic exports, or exports of United Kingdom produce and manufacture, from total exports:

CLASS	Total imports		Net imports	
	1905	1912	1905	1912
From foreign countries	438,368	558,627	395,677	503,174
From British possessions	126,652	186,013	91,616	129,800
Total*	565,020	744,641	†487,240	†632,903
	Total exports		Domestic exports	
	1905	1912	1905	1912
To foreign countries	284,050	407,418	215,599	310,131
To British possessions	123,547	191,543	114,217	177,093
Total	407,597	598,961	329,817	487,223

* Exclusive of the value of diamonds from the Union of South Africa.

† Reëxports in excess of imports to unknown countries were about £53,000 in 1905 and £71,000 in 1912.

Trade with the principal countries in 1905 and in 1912 is shown in the following table, in thousands of pounds sterling; the import figures indicate the net value of merchandise consigned to and retained in the United Kingdom; the export figures indicate the value of the produce and manufacture of the United Kingdom consigned abroad.

COUNTRY	Imports		Exports	
	1905	1912	1905	1912
United States	105,483	123,401	23,916	30,066
Germany	50,947	65,841	29,841	40,363
British India	25,499	40,419	42,996	57,626
France	41,481	40,108	16,046	25,586
Argentina	24,409	39,352	12,997	20,550
Russia	33,086	38,091	8,169	13,738
Canada	23,341	25,694	11,909	23,531
Australia	17,803	23,787	16,991	34,841
Belgium	15,904	22,772	8,595	12,193
Denmark	14,988	21,938	4,129	5,798
Netherlands	13,308	20,846	9,671	14,282
Egypt	12,489	19,608	7,849	9,448
New Zealand	10,620	16,094	6,426	10,390
Spain	13,179	13,557	4,246	6,887
Sweden	10,056	12,740	5,195	7,137
Japan*	1,583	3,419	9,662	12,229
China†	962	3,176	13,137	10,780
Total, including others†	487,240	632,903	329,817	487,223

* Including Formosa.

† Exclusive of Hongkong, Macao, and Weihaiwei.

Shipping. British expansion is due largely to British shipping. British shipping expansion dates from the time of the mercantilists. (See *Commerce.*) The Navigation Laws of the seventeenth century were intended to give English vessels a maximum of the carrying trade. Fishing was encouraged and trained men in a seafaring life, and great pains were taken with marked success by the government to develop skill in shipbuilding. Naval victories in the Napoleonic wars gave British vessels almost a complete monopoly in the world's carrying trade. About that time, however, British shipping met a formidable rival in the American merchant fleet. Favored by superior forest resources, the American fleet developed very rapidly, until its tonnage in 1860 almost equaled that of the United Kingdom. The American Civil War and the change from wood to iron in shipbuilding resulted in greatly benefiting British shipping and almost ruining that of the United States.

In 1913 American tonnage was about two-thirds as large as British, but most of the British shipping was in foreign trade and very little of the American. Over 50 per cent of Chinese external trade is carried in British ships, and they hold foremost rank also in Japanese oversea trade. Two-thirds of the tonnage passing through the Suez Canal is British. Registered vessels employed in the home and foreign trade in 1912 (not including vessels employed on rivers and in inland navigation): 3386 sailing vessels, of 569,038 tons net, and 9672 steamers, of 11,145,160 tons; total, 13,058 vessels, of 11,714,198 tons. In 1900 there were 7480 sailing vessels, of 1,989,731 tons, and 7455 steamers, of 7,405,476 tons; total, 14,935 vessels, of 9,395,207 tons. Persons employed in 1912, 286,806; in 1900, 247,448.

Shipping has been greatly facilitated by river and harbor improvements, as, e.g., by the broadening of the river Clyde to Glasgow and the construction of the Manchester Ship Canal. London receives and distributes the greater portion of the Continental and Oriental trade. Cardiff, as a result of its growing exports of coal, is now next to London and Liverpool in the amount of its annual shipping tonnage. Liverpool, ranking next to London, is favored by its position for the trade with America. Other important ports are Newcastle (with North and South Shields), Hull, Grimsby, Leith, Glasgow, Southampton, and Cork (including Queenstown).

Banking. Banking was introduced into Great Britain by the goldsmiths of London in the seventeenth century. The banking systems of England and Scotland have developed independently and naturally along somewhat divergent lines. In England the first connection of the government with banking occurred in 1694, when the financial exigencies of the nation made necessary the advancement of a loan, and the Bank of England was chartered in order that a loan might be secured. This bank, through special privileges granted it by the government—as, e.g., the management of the national debt, the position of being the bank of the government, and until 1826 of being the only joint-stock bank in England, and the power to issue notes—has attained an overshadowing prominence among the banks of that country and among the banks of the world. The monopoly rights implied restrictions on other banks, so that provincial banking in Great Britain is generally admitted to have been inadequately provided for. The Bank of Scotland was organized one year later (1695) than the Bank of England, and it, too, at first (for 21 years) enjoyed monopoly rights; but, unlike the English bank, it did not secure a renewal of its patent rights. This gave an opportunity for the growth of other banks, which have coöperated to secure a uniform system of banking throughout Scotland. The formation of joint-stock companies was also permitted with liberal privileges in respect of note issue. The authorized note issues of Scottish banks may be exceeded, providing there is a specie reserve equal in amount to the excess of the issues—a precaution which, of course, strengthens the circulation. This reserve is considered as part of the cash balance of the bank. The Scottish banks do not lose their rights of issue in Scotland when they open offices or branches in London or in the English provincial towns. In England laws were passed in 1826 which admitted the establishment of joint-stock banks beyond a radius of 65 miles from London, the number of partners not to exceed six. This number was increased in 1862 to 10, except for banks of issue; the latter are still limited to six.

By the Bank Charter Act of 1844 the issue department was separated from the banking department of each bank, and the issue of bank notes was limited to those banks already exercising that privilege. These institutions were restricted to a fixed issue, and if they established themselves within a radius of 65 miles from London they forfeited their rights to issue notes. Under these laws the number of note-issuing banks is decreasing, and this function will probably become the exclusive right of the Bank of England unless the laws are changed. The Bank of England notes are legal tender for all sums over £5 except at the bank and its branches and in Scotland and Ireland. The English and Scottish bankers pursue different policies in matters of interest and commission, the English being inclined to cut rates and to underbid for business, while the Scottish adhere to uniform terms in accordance with an agreement between them. The policies also differ in respect of the dependence placed upon different sources of profit. In England the directors have more to do in the management than in Scotland, while in Scotland the agents play a more important part than in England. The Scottish bankers have become famous for the perfection attained in bookkeeping methods.

In 1827 there were 465 private and 6 joint-stock banks in England and Wales; in 1905 the private banks had decreased to 12 and the joint-stock banks had increased to 62. In 1914 there were 44 English joint-stock banks with 5802 branches. In Scotland there were in 1914 only 9 banks (all joint-stock), with 1240 branches. In December, 1914, the Bank of England (banking department) had capital and "rest" amounting to £17,830,000; deposits and post bills, £155,190,000; securities, £121,050,000; notes in reserve, £51,340,000. In the issue department, notes issued, £87,480,000; securities, £18,450,000; gold coin and bullion, £69,030,000. The English joint-stock banks at the beginning of 1914 had paid-up capital, £63,023,000; reserve funds and undivided profits, £41,618,000; notes in circulation, £29,735,000; deposit and current accounts, £880,694,000; cash in hand and at call, £270,941,000; discounts, advances, etc., £591,937,000; total assets, £1,081,821,000; total liabilities, the same. The Scottish joint-stock banks had paid-up capital, £9,241,000; reserve funds and undivided profits £9,243,000; notes in circulation, £7,744,000; deposit and current accounts, £125,887,000; cash in hand and at call, £3,961,000; discounts, advances, etc., £77,764,000. The Irish joint-stock banks had the corresponding figures: £7,309,000; £4,283,000; £8,074,000; £70,657,000; £17,189,000; £48,600,000. The colonial and the foreign joint-stock banks with London offices have added largely to the total banking business of the Kingdom.

Savings Banks.—A savings bank was established in Scotland in 1810, and soon after such institutions became established in different parts of Great Britain. Under the Law of 1817 and subsequent laws these banks were placed under the regulation of the government, and during the second quarter of the nineteenth century they enjoyed a rapid growth. The deposits of these banks are turned over to the Bank of England, which allows a specified rate of interest upon them. The rate of interest paid depositors varies, but is in excess of that ordinarily paid by banks to their depositors. The trustees are prohibited from receiving any profits. The growth of the old, or trustees, savings banks was checked by the establishment of the postal savings banks.

The scheme for the operation of postal savings banks went into effect in 1861. Deposits, including interest, have a maximum limit of £200. Depositors cannot deposit more than £50 in any one year. Two and one-half per cent interest is allowed on deposits. The depositor may withdraw his money at once through any postal savings bank in the United Kingdom. The number of depositors in the postal savings banks increased from 2,184,972 in 1880 to 9,673,717 in 1904 and 13,198,609 in 1913; and the amount they invested increased from £11,079,137 in 1880 to £44,108,600 in 1904, and to £55,541,010 in 1913. The number of depositors in the trustees savings banks also showed an increase during the before-mentioned period, being 1,519,805 in 1880, 1,704,766 in 1904, and 1,912,816 in 1913. The amount invested in the latter banks amounted to £9,008,315 in 1880, £12,560,322 in 1904, and £14,284,386 in 1913. Penny savings banks and special savings banks for soldiers and seamen have been established. The granting of annuities and the insuring of lives are also provided for through the postal service. See War in Europe.

Finance. The ordinary expenditures incurred in the maintenance of the national government are increasing rapidly, necessitating a correspondingly greater national income. The following table shows the revenue and expenditures for years ending March 31.

YEAR	Revenue	Expenditures
1895	£101,697,304	£100,931,963
1900	129,804,566	143,678,068
1905	153,182,782	151,768,875
1910	131,696,456	157,944,611
1913	188,801,999	188,621,930
1914	198,242,897	197,492,969

Below are shown the principal heads of revenue (exchequer receipts for years ending March 31).

ITEMS	1895	1905	1913	1914
Customs	£20,310,675	£35,907,746	£33,485,000	£35,450,000
Excise	30,714,088	36,065,673	38,000,000	39,590,000
Estate, etc., duties	10,872,059	16,668,959	25,248,000	27,359,000
Stamps *	5,721,000	7,700,000	10,059,000	9,966,000
Land tax	1,015,000	750,000	700,000	700,000
House duty	1,435,000	2,000,000	2,000,000	2,000,000
Property and income tax	15,600,000	31,250,000	44,806,000	47,249,000
Land-value duties	....	....	455,000	715,000
Total	£85,668,542	£130,342,378	£154,753,000	£163,029,000
Post office	10,760,000	16,100,000 }	29,175,000	30,800,000
Telegraph service	2,580,000	3,830,000 }		
Crown lands †	410,000	470,000	530,000	530,000
Suez Canal, etc. ‡	412,976	1,014,303	1,418,900	1,579,972
Miscellaneous §	1,865,786	1,426,101	2,925,099	2,303,925
Total revenue	£101,697,304	£153,182,782	£188,801,999	£198,242,897

* Exclusive of fee and patent stamps.

† Net receipts.

‡ Receipts from Suez Canal shares and sundry loans.

§ Including fee and patent stamps.

For the same years the expenditure (exchequer issues), under the principal heads thereof, was as follows (the figures in parenthesis show items in the principal head preceding).

In the following table the figures for interest of funded debt and for new sinking fund are included in those for national debt services; the figures for law and justice, for education, and for charitable services are included in those for civil services. The table discloses the great burden of the national debt and the rapid increases in recent years for the army, the navy, education, old-age pensions, and the post-office services (which include telegraphs and telephones).

CLASSIFICATION	1895	1905	1913	1914
I. Consolidated fund services:				
National debt services	£25,000,000	£27,000,000	£24,500,000	£24,500,000
(Interest of funded debt)	(16,220,544)	(15,938,911)	(15,000,752)	(14,787,109)
(New sinking fund)	(1,718,263)	(2,237,679)	(4,620,303)	(5,228,485)
Local taxation accounts, etc.	7,013,542	10,969,245	9,653,299	9,734,128
Civil list	407,774	470,000	470,000	470,000
Annuities and pensions	316,758	248,845	320,883	316,576
Salaries and allowances	81,618	79,190	56,468	56,547
Courts of justice	514,633	514,001	523,450	533,042
Miscellaneous	281,638	296,594	321,625	317,725
Total	£33,655,963	£39,577,875	‡ £37,017,930	‡ £37,322,969
II. Supply services:				
Army (including ordnance factories)	17,900,000	29,225,000	28,071,000	28,346,000
Navy	17,545,000	36,830,000	44,365,000	48,833,000
Civil services	18,915,000	27,450,000	51,944,000	53,901,000
(Law and justice)	....	(3,760,000)	(4,470,000)	(4,491,000)
(Education)	....	(15,575,000)	(19,531,000)	(19,450,000)
(Charitable services, etc., including old-age pensions)	....	(653,000)	(13,006,000)	....
Customs *	835,000	908,000	2,324,000	2,431,000
Inland revenue *	1,811,000	2,185,000	1,876,000	2,052,000
Post-office services	10,270,000	15,593,000	23,024,000	24,607,000
Total	£67,276,000	£112,191,000	£151,604,000	£160,170,000
Grand total †	£100,931,963	£151,768,875	£188,621,930	£197,492,969

* Excise was transferred from inland revenue to customs in the fiscal year 1910.

† That is, total expenditure chargeable against revenue.

‡ Includes for road-improvement fund £1,172,205 in 1913 and £1,394,951 in 1914, not shown in table.

As a result of the changed tariff policy, customs duties are relatively less important than in the middle of the nineteenth century, although they have almost held their own absolutely. Collections from excise duties, on the other hand, have about doubled during the same period. The death duties and income tax have latterly become very important sources of revenue.

The British budget is noted for its adjustment of the burden of taxation in such a manner as will make it least felt, i.e., in accordance with the ability of people to pay. The income tax was first resorted to in 1798 as a special means of raising revenue for war purposes. In 1815–42 it was abolished, but was revived in 1842 because of the reduction of the corn (grain) taxes. The income tax has now become a permanent feature in the national budget. Incomes not exceeding £160 are exempt from the tax, and the moderate incomes, or those below £700, are favored by abatements. The income tax is made to fluctuate more or less as the annual exigencies of the budget may demand. The income-tax rate has gradually increased from 2d. per pound in 1874, until in 1913 it ranged from 9d. to 1s. 2d. in the pound. Like the income tax, the death rates favor the masses. The most important fiscal change made during 1875–1900 was the readjustment of the death rates in 1894 so as to increase them and extend their application to all the estates probated, thus adding greatly to the returns of the tax. The most important of this class of taxes are the estate duties and the legacy duties. Since 1851 there has been an inhabited-house duty (levied in Great Britain only), taking the place of the old window tax assessed prior to that date. This tax is not levied upon property rented for less than £20 per year, thus exempting the houses of the working classes.

In 1840, before the introduction of the free-trade policy (the sweeping Corn Laws were passed in 1846, and the policy became fully operative about 1860), 1046 articles were taxed. In 1913 the number had been reduced to 21 articles (or classes of articles; the category sugar, e.g., includes many confections). The articles now taxed are those not produced in the United Kingdom or such as are considered luxuries. The latest article in the category of necessary products, sugar, was placed upon the free list in 1874, but the exigencies of the South African War led to the reimposition of a duty upon sugar, the raising of the duty upon tea, tobacco, spirits, and beer, and the assessment of an export duty on coal. This last was discontinued in 1907. Tobacco and tea are the chief customs revenue producers, yielding respectively, in the fiscal year 1913, £17,254,125 and £6,151,879. Other dutiable articles are spirits, wine, beer, coffee, currants, raisins, and cocoa. The principle of protection is generally considered to have been wholly abandoned in the British revenue policy, but the tariff is still in a limited way highly protective and is shaped expressly to aid British manufacturers. Thus a distinction is made between raw cacao and the manufactured cocoa, roasted and unroasted coffee, manufactured and unmanufactured tobacco; and the distinction is sufficiently large to guarantee the importation of the raw products and render possible the prosperity of the home industries based upon them. In 1913 the import duty on unmanufactured tobacco was from 3s. 8d. to 4s. 1½d. per pound and on manufactured tobacco from 4s. 8d. to 7s. per pound; the 7s. duty was for cigars. Raw coffee was taxed at 14s. per hundredweight, while kiln-dried or roasted was taxed at 2d. per pound. The tea duty was 5d. per pound. The foregoing applies to conditions existing before the great war which began in 1914. The enormous additional revenue required for the war made necessary the imposition of import and export duties on many articles. See WAR IN EUROPE.

The British fiscal system applies uniformly to England and Wales, Scotland, and Ireland, but Ireland is exempt from the land tax and the inhabited-house duty. The burden of the indirect taxes is relatively much heavier in Scotland and Ireland than in England. The income tax had a total net produce of £18,828,958 in the fiscal year 1900, £30,966,404 in 1905, and £41,574,277 in 1913. The latter amount was derived from a total income of £755,577,547; the total income brought under the review of the inland-revenue department for the year was £1,111,456,413, of which the share of England and Wales was £970,093,437, Scotland £99,884,044, and Ireland £41,478,932. Of the total revenue in the fiscal year 1913, about 81.8 per cent was contributed by England and Wales, about 10.6 per cent by Scotland, and about 5.7 per cent by Ireland.

The local taxes are annually supplemented by appropriations from the Imperial revenues. The levying and collecting of the local rates are in the hands of the elected local overseers, the valuation list being made to include every class of property. The rates for real property are based upon the annual value of the property as determined by the amount it will rent for. The town councils, boards of guardians, and school boards are the local spending bodies. In recent years local expenditure and indebtedness have increased rapidly. British municipalities have become noted for their activity in assuming the ownership and control of productive properties, ofttimes receiving the net revenue from this source.

National Debt. The United Kingdom sustains the burden of a heavy debt which is exceeded only by the debts of France and Russia. The beginning of the debt dates from the reign of Charles II and in 1688 amounted to £664,263. The wars of William III raised it to £12,767,225, and by the commencement of the American war in 1775 it had increased to £126,842,811. The war with the American Colonies almost doubled this figure, leaving it in 1784 at £243,063,145. This was followed by the enormously expensive Napoleonic wars, which augmented the debt until in 1815 it was £861,039,049. At the commencement of the Crimean War in 1854 it had been reduced to £804,226,354, and at the end of that war it stood at £836,144,597. From that time it decreased until 1899; at the end of that fiscal year it stood at £628,021,572. The expenditure for the Boer War raised it again until it reached £770,778,762 in 1903. It declined to £702,687,897 in 1909, rose to £713,245,408 in 1910, and declined to £661,473,765 at the end of the fiscal year 1913. The figure for the debt in 1913 included: nominal amount of funded debt, £593,453,857; estimated capital liability in respect of terminable annuities, £31,519,908; unfunded debt, £36,500,000. In addition to this debt of £661,473,765, there were capital liabilities in respect of sums borrowed under various acts amounting to £54,814,656, so that the aggregate gross liabilities of the state were £716,288,421 (as compared with £798,349,190 in 1907 and £635,393,734 in 1899). The debt services for the fiscal year 1913 aggregated £24,500,000, including £15,000,752 interest of funded debt, £3,540,175 terminable annuities, £1,171,863 interest of unfunded debt, £166,907 management of the debt, and £4,620,303 new sinking fund. The estimated assets at the end of the year included: Suez Canal shares, estimated at £39,015,000; other estimated assets, £3,707,733; exchequer balances at the Bank of England and Bank of Ireland, £6,329,160. From March 31, 1913, to March 31, 1914, the public debt decreased from £661,473,765 to £651,270,-

091; but by March 31, 1916, as a result of the great war, it had increased to the enormous total of £2,140,000,000.

Weights, Measures, and Coinage. Two systems of weights and measures are legal not only in the United Kingdom but throughout the British Empire, viz., the Imperial and the metric. The Imperial system is constituted from a variety of ancient and of customary trade denominations and was legalized in 1824. The metric system was permitted to be used for retail trade in 1897, though it had been employed for many years prior to that by chemists, physicists, and manufacturers. Standards of weight and measure are kept at the standards department, Old Police Yard, Westminster, under the custody of the Board of Trade; with these standards other standards must be compared and verified. In practice the ancient native weights, measures, and coinage are still in common use in India. See INDIA.

Defense. *Navy.*—The British navy is controlled by a Board of Admiralty, which consists of six members, viz., the first lord, the first naval lord, the second naval lord, the third naval lord and controller, the fourth or junior naval lord, and the civil lord. Two other officers, not members of the board, are the parliamentary and financial secretary and the permanent secretary. The system of defense and the military and naval arrangements of the United Kingdom are peculiarly distinctive of that country. The predominating factors are its insular position and the vast extent of foreign domains that need protection. Both of them unite in making the country's safety dependent upon the strength of its navy, and accordingly this has received chief attention from the government. A rule which has been adopted is to keep the fleet as strong as the combined naval forces of any two other countries. All the principal ports are provided with fortifications, but protection against attack is left to the fleet, to mine fields, booms (carrying wire nets), wire nets supported by buoys, and the defense mobile. In time of war the latter consists of torpedo boats (including submarines) and the naval patrol. The character of the defense in all cases depends upon the local peculiarities and the general war conditions. The wire nets are intended to entangle submarines and are watched by the patrol. In the present (1916) war they have proved very efficient as a protection to the ports and to the great fleet which has its headquarters at Rosyth. Since the nets have been in position no German submarines are known to have passed through or over them and a large number have been caught in their meshes and destroyed.

The personnel of the navy consists of the active force and the reserve. (See NAVAL RESERVE.) The education of officers is fully described under NAVAL SCHOOLS OF INSTRUCTION. The enlisted force is recruited by voluntary enlistment. Preparation for the service begins between the ages of 15 and 16½ years, a term of two years being served in the training ships, at the end of which period the recruit may be drafted into the fleet to serve for a period of 12 years, when he may leave the service or reënlist for an additional period of 10 years.

On Jan. 1, 1914, the personnel was as follows: three admirals of the fleet, 12 admirals, 22 vice admirals, 56 rear admirals, 683 captains and commanders, 2414 other line officers, 563 midshipmen at sea, 848 engineer officers, 593 medical officers, 685 pay officers, 118 naval constructors, 151 chaplains, 2693 warrant officers, 115,208 enlisted men, 471 marine officers, 21,033 marines and coast guard; total, 145,553. The naval estimates for 1913–14 increased the number to about 151,000. Successive additions since then have brought the total to 300,000. The naval budget for 1914–15 was £52,705,779. The war has greatly increased the expenditure, but the exact amount is of course unknown.

At the outbreak of the war the fleet was organized as follows:

HOME WATERS
First Fleet (except 4th Cruiser squadron)
  1. 1st Battle squadron: 8 dreadnoughts
     (1 with 10 13.5-inch guns; 7 with 10 12-inch)
  2. 2d Battle squadron: 8 dreadnoughts
     (all carried 13.5-inch guns)
  3. 3d Battle squadron: 8 predreadnoughts
     (*King Edward* type, 4 12-inch)
  4. 4th Battle squadron: 3 dreadnoughts, 1 predreadnought
     (all carried 12-inch guns)
  5. 1st Battle Cruiser squadron: 4 battle cruisers
  6. 2d Cruiser squadron: 4 armored cruisers
  7. 3d Cruiser squadron: 4 armored cruisers
  8. 1st Light Cruiser squadron: 4 light cruisers
Second Fleet
  1. 5th Battle squadron: 8 predreadnoughts
     (*Bulwark* type, 4 12-inch)
  2. 6th Battle squadron: 5 predreadnoughts
     (*Duncan* type, 4 12-inch)
  3. 5th cruiser squadron: armored cruisers
     (county class)
  4. 6th Cruiser squadron: armored cruisers
     (*Drake* class)
Third Fleet
  1. 7th Battle squadron: predreadnoughts
     (*Majestic* type, 4 12-inch)
  2. 8th Battle squadron: predreadnoughts
  3. 7th, 8th, 9th, 10th, 11th, 12th Cruiser squadrons
     (cruisers of all sorts)
Mediterranean Fleet
  1. 2d Battle Cruiser squadron: 3 battle cruisers
  2. 1st Cruiser squadron: 4 armored cruisers
  3. 2d Light Cruiser squadron: 4 light cruisers
FAR EAST
  1 battleship
  2 light cruisers
  2 cruisers (armored and unarmored)
  8 destroyers
  3 submarines
PACIFIC
  1 battleship
  1 battle cruiser
  5 light cruisers
  6 cruisers (armored and unarmored)
  3 destroyers
  4 submarines
ATLANTIC
  6 cruisers (armored and unarmored)

The principal dockyards are at Chatham, Devonport, Pembroke, Portsmouth, Rosyth, and Sheerness. Rosyth is the great naval base and repair station on the east coast of Scotland. Smaller dockyards are located at the Cape of Good Hope, Esquimault (Vancouver Island), Gibraltar, Halifax (Nova Scotia), Haulbowline (Cove of Cork), Hongkong, Jamaica, Melbourne, Malta, and Sydney. Naval stations, some with shops, exist at Ascension Island, Bombay, Calcutta, Colombo, Dartmouth, Delagoa Bay, Deptford, Greenwich, Plymouth, Portland, Sydney, Trincomali, Weihaiwei, and London (West India Docks).

The naval schools are at Dartmouth, Osborne, Greenwich, Keyham, etc., and are fully described under NAVAL SCHOOLS OF INSTRUCTION, *Great Britain*.

The Australian navy consists of 1 battle cruiser of 18,800 tons, 2 fast cruisers of 5400 tons, 1 cruiser of 5880 tons, 1 cruiser of 2200 tons, 3 destroyers of 700 tons. Two submarines of 810 tons were lost during the war. One fast cruiser of 5400 tons and 3 destroyers of 700 tons are under construction at the dockyard on Cockatoo Island, Sydney Harbor. This dockyard is the principal one in the state, but there are naval bases and repair stations in Cockburn Sound and Port Western. In 1915 the personnel of the Australian navy consisted of: permanent force, 3700; naval reserve (marines), 493; naval reserve and cadets, 5024; royal naval reserve, 750; total, 9967.

The Canadian navy is of considerably less importance than the Australian, largely owing to its being nearer England. It consists of the protected cruisers *Niobe*, 11,000 tons (completed 1897), and *Rainbow* (completed 1891). They are both used as training ships—the *Niobe* on the Atlantic coast, the *Rainbow* on the Pacific. As Great Britain maintains dockyards at Halifax and Esquimault, no others are necessary. The vessels of the revenue service, surveying department, and fisheries protection can be put in service for the defense mobile, and one mine layer and one transport were in reserve when the war broke out.

Army.—The military forces of Great Britain fall under several categories. The principal divisions are the regular army and the territorial army. The regular army in India, South Africa, and the colonies is designated as the British army, to distinguish it from the native Indian army in India (q.v.) and the local forces in South Africa (q.v.) and in the British colonies. In addition to the forces already enumerated the self-governing countries, Australia, New Zealand, and Canada (qq.v.), maintain considerable and efficient forces of militia. Large contingents for the European War were furnished by the three countries named.

The regular army in peace is divided into three classes: the permanent or standing army, called the regular army; the army reserve; and the special reserve. Service in all categories is voluntary and as follows: with the colors or regular army, from 3 to 9 years; in the army reserve, 9 to 3 years; total, 12 years, which may be extended to 21 years. Age of enlistment is between 18 and 25 years. The army reserve and special reserve furnish the men to bring the peace units to war strength.

The regular army prior to the great war was composed of 31 cavalry regiments (19 at home), 25 horse artillery batteries (13 at home), 147 field batteries (99 at home), 9 mountain batteries (all abroad), 99 companies of garrison artillery (43 at home), 77 companies of engineers (56 at home), 9 battalions of foot guards, 148 battalions of infantry (74 at home), besides administrative troops.

The special reserve was created out of the militia abolished in 1907; it is available for service abroad in war. Of the 101 infantry battalions of this reserve 74 are attached to regular regiments as depot battalions to supply vacancies in the regular regiments. The remaining 27 battalions are extra reserve battalions, which upon mobilization are filled up as separate organizations and sent into the field. In addition to the 101 battalions of infantry there are 3 cavalry regiments, 2 regiments of garrison artillery, and 2 battalions of engineers in the special reserve. Service in this reserve is for 6 years. Recruits have 5 months' preliminary training, a subsequent annual training of 3 weeks, and 6 days additional for infantry target practice.

The territorial army of Great Britain, for home defense of the British Islands, corresponds to the United States organized militia. Service is voluntary, for 4 years; enlistments are between 17 and 35 years of age. Two weeks' annual camp and a certain number of drills and target practice are required. The officers are civilians with few exceptions. The organization corresponds to that of the regulars. The bulk of this force is organized as 14 divisions and 14 mounted brigades. A large part of this force volunteered for service abroad during the European War.

Higher Organization.—The regular troops within the British Islands are organized for war as the expeditionary force; which is composed of a cavalry division, 6 infantry divisions, army troops, and line of communication troops; total strength, 165,000. The cavalry division consists of 4 brigades of 3 regiments each, 2 horse artillery brigades (battalions), 4 engineer troops, 1 signal squadron, and 4 signal troops, 1 aëroplane squadron, 1 cavalry train, and 4 field ambulance companies; total, 486 officers, 9410 men, 10,195 horses, 24 guns.

An infantry division is composed of 3 infantry brigades of 4 battalions each, 4 field artillery brigades (battalions, 1 of which is a howitzer brigade), 1 heavy field battery, 1 ammunition column, 2 companies of engineers, 1 signal company, 1 squadron of cavalry, 1 aëroplane squadron, 1 divisional train, 3 field ambulance companies; total, 598 officers, 18,075 men, 6161 horses, 76 guns. British infantry regiments are organized only for recruiting purposes and normally are not used as tactical units. Such a regiment consists of from 2 to 4 regular battalions (half at home and half abroad) and 1 or 2 special reserve battalions. An infantry brigade commanded by a brigadier general consists of 4 battalions. The battalion of 4 companies is commanded by a lieutenant colonel, a company by a major or captain. War strength of a battalion is 29 officers and 995 enlisted men, which will give about 900 rifles on the firing line.

The British artillery (all branches) is known as the Royal Regiment of Artillery. The regiment is divided into the Royal Horse Artillery, the Royal Field Artillery, and the Royal Garrison Artillery. The British field artillery, as is the case with their artillery in general, has an unusual organization. Batteries are commanded by majors and contain 6 guns, except the heavy field-gun batteries, which have 4 guns. Horse and field batteries are grouped as brigades (battalions) of 2 and 3 batteries respectively. Heavy gun batteries are not brigaded. Brigades are grouped under a general officer to form divisional artillery. There are 76 guns with the infantry division. Cavalry divisions have 24 guns. Peace strength of batteries varies from 4 officers and 87 men to 5 officers and 179 men; war strength, horse batteries, 5 officers and 203 men; field batteries, 5 officers and 198 men; heavy field battery, 6 officers and 224 men; siege battery, 5 officers and 124 to 181 men. A coast artillery company varies from 4 to 7 officers and from 100 to 230 men. Total coast artillery, British Isles, colonies, and India, 81 companies, 14,965 officers and men.

A cavalry regiment, consisting of 3 squadrons, at war strength musters 25 officers and 537 men and is a little less than half the strength of a United States regiment. Regiments are grouped in brigades of three each. The squadron corresponds to the troop in the United States.

It counts about 150 sabres in war and is commanded by a major. Technical duties, which in the United States pertain to the engineers and to the signal corps, are performed by the Royal Engineers. The company is the unit of organization and varies in war, according to duties, from 3 officers and 106 men to 6 officers and 386 men. An army service corps provides the supply train troops. Sanitary troops and a veterinary corps are also provided.

The total peace establishment before the European War, including the regular army at home and abroad, the army reserve, the special reserve, and the territorial force, aggregated 803,037 of all ranks. The peace budget was $144,225,000. After this original estimate for 1914–15 the army was increased to war strength at the end of 1915 by voluntary enlistment to about 3,000,000 men, exclusive of those serving in India. This figure did not include the territorial army serving at home.

Army Administration.—For the purposes of command and recruiting the United Kingdom is divided into seven territorial districts. At the head of each is a general officer with necessary assistants. The land forces are administered by an army council, composed of the Secretary of State for War, the Chief of the Imperial General Staff, the Adjutant General, the Quartermaster-General, the Master-General of the Ordnance, the Parliamentary Undersecretary of State, the Finance Member. The Inspector General of the Forces keeps this council informed of the condition of the army.

Infantry and cavalry have the Lee-Enfield rifle, calibre 0.303 inch. Light field artillery is armed with the 18-pounder, horse artillery with the 13-pounder, and heavy field artillery with the 40-pounder field howitzer and a 60-pounder gun. Aviation, especially by aëroplanes, has been greatly developed and improved by the experiences of the European War. The Royal Flying Corps (military wing) was organized Jan. 16, 1915. The number of squadrons and number of aëroplanes in each had not been made public in 1916. Before the reorganization in 1915, 8 aëroplane squadrons, each of 18 aëroplanes, had been organized.

Population. The first official census taken of Great Britain was in 1801. According to estimates made upon the basis of the Domesday record the total population of England in 1050–1100 was a little less than 2,000,000. Over half of the population was then centred in southeast England—in the counties north and south of London—the Norman Conquest having depopulated vast districts in north England. Investigators claim that it took over five centuries to double this figure. Lack of communication resulted in frequent starvation periods in numerous localities. This, together with occasional plagues, prevented a regular and normal increase. The great modern growth in population dates from the industrial evolution and the improvement in means of communication. The most remarkable feature in this development is the drift of the population from the south to the north. This was the result of improved inventions and methods which secured for manufacturing the aid of water power supplied by the streams of Lancashire and Yorkshire. Still later, when coal and iron were extensively used, these minerals also were found most abundant in this northern district. The greater moisture of the atmosphere in this region increased its desirability as a textile manufacturing centre and encouraged the growth of its population. The manufacturing and mining district around Manchester and extending southward to Birmingham is the most densely populated district of equal area in Great Britain or in the world, with the possible exception of certain districts of China. The table below shows by divisions the area (including inland water) of the United Kingdom, and the population according to the censuses of April 1, 1901, and April 3, 1911, together with the density per square mile on the latter date; figures also are shown for the Isle of Man and the Channel Islands, which, though not politically a part of the United Kingdom, are included in the British Isles.

DIVISION	Square miles	Population 1901	Population 1911	Density
England..........	50,874	30,813,043	34,045,290	669
Wales............	7,466	1,714,800	2,025,202	271
Scotland..........	30,406	4,472,103	4,760,904	156
Great Britain....	88,746	36,999,946	40,831,396	460
Ireland............	32,586	4,458,775	4,390,219	135
United Kingdom.	121,331	41,458,721	45,221,615	373
Isle of Man........	227	54,752	52,016	229
Channel Islands....	75	95,618	96,899	1,292
British Isles.....	121,633	41,609,091	45,370,530	374

The foregoing population figures do not include army, navy, and merchant seamen abroad, numbering, in 1901, 224,211.

The population of England at various periods, as calculated from the numbers of baptisms, burials, and marriages, is stated as follows: in 1570, 4,160,000; in 1600, 4,812,000; in 1630, 5,601,000; in 1670, 5,774,000; in 1700, 6,045,000; in 1750, 6,517,000. The population present in the British Isles has been returned by the several censuses as shown in the table below.

	England and Wales	Scotland	Ireland	United Kingdom	Man and Channel Islands
1801	8,892,536	1,608,420	....	....	......
1811	10,164,256	1,805,864	....	....	......
1821	12,000,236	2,091,521	6,801,827	20,893,584	......
1831	13,896,797	2,364,386	7,767,401	24,028,584	......
1841	15,914,148	2,620,184	8,175,124	26,709,456	......
1851	17,927,609	2,888,742	6,552,385	27,368,736	143,126
1861	20,066,224	3,062,294	5,798,967	28,927,485	143,447
1871	22,712,266	3,360,018	5,412,377	31,484,661	144,638
1881	25,974,439	3,735,573	5,174,836	34,884,848	141,260
1891	29,002,525	4,025,647	4,704,750	37,732,922	147,842
1901	32,527,843	4,072,103	4,458,775	41,458,721	150,370
1911	36,070,492	4,760,904	4,390,219	45,221,615	148,915

Of the total population of the British Isles in 1911, 22,016,661 were males and 23,353,869 females; in England the number of males was 16,421,298 and of females 17,623,992; in Wales, 1,024,310 and 1,000,892; in Scotland, 2,308,839 and 2,452,065; in Ireland, 2,192,048 and 2,198,171; in the Isle of Man, 23,937 and 28,079; in the Channel Islands, 46,229 and 50,670. The increasing importance of manufacturing and mining as against agriculture has given England a larger percentage of urban population than any other country.

In England and Wales the population of urban districts in 1901 was 25,058,355 and of rural districts 7,469,488; in 1911, 28,162,936 and 7,907,556. In Scotland the urban population (which in that country includes localities with over 1000 inhabitants) numbered 3,591,276. In Ireland the civic population in 1911 numbered 1,470,595. For many years the rural increase of population in Great Britain has been insignificant as compared with the urban.

The gain in the population of the United Kingdom has been made notwithstanding the great emigration to its colonial possessions or to other countries. The largest was in 1880–93, when the English emigration averaged over 150,000 annually. The United States received about two-thirds of the whole number. The number of outward-bound passengers of British nationality from the United Kingdom to countries out of Europe was 8,864,756 in the period 1853–1900; in 1901–05, 1,170,839; in 1906–10, 1,670,625; in 1911, 454,527; in 1912, 467,666, in addition to which outward-bound alien passengers to non-European countries numbered 189,169, the total outward bound in 1912 being 656,835. Inward-bound passengers in 1912 from non-European countries numbered 340,696 (199,181 British and 141,515 alien), the balance outward for the year being 316,139. The Aliens Act of 1905 aims to keep out undesirable immigrants without infringing on the traditional right of asylum to religious and political refugees. The birth and death rates are decreasing; the marriage rate remains more nearly stationary. The following table shows the rate per thousand of population, of births, deaths, and marriages (i.e., persons married).

	England and Wales	Scotland	Ireland	United Kingdom
Births				
1900......	28.7	29.6	22.7	28.2
1910......	25.1	26.2	23.3	25.0
1913......	23.9	25.5	22.9	23.9
Deaths				
1900......	18.2	18.5	19.6	18.4
1910......	13.5	15.3	17.1	14.0
1913......	13.7	15.5	17.1	14.2
Marriages				
1900......	16.0	14.6	9.5	15.1
1910......	15.0	13.0	10.1	14.3
1913......	15.5	14.3	10.2	14.9

In Wales and Monmouthshire persons of three years of age and upward speaking Welsh only constituted in 1901 about 13.9 per cent of the population and in 1911, 7.9 per cent; speaking Welsh and English, 32.2 in 1901 and 32.5 in 1911; thus about 40.6 per cent could speak Welsh in 1911, as compared with 46.1 in 1901 and about 70 in 1881;—in Scotland, speaking Gaelic only, 0.6 per cent in 1901 and 0.4 per cent in 1911; speaking Gaelic and English, 4.5 and 3.9;—in Ireland, speaking Irish only, 0.4 per cent in 1911; speaking Irish and English, 12.9. For further details of population, see England; Scotland; Ireland.

Religion. In England and Wales, in Scotland, and in Ireland, different churches are dominant; in the first the Protestant Episcopal, in the second the Presbyterian, and in the third the Roman Catholic. In the first two the respective churches are the Established state churches. The Protestant Episcopal church was also the Established church of Ireland during 1801–61. The religious reformation of the sixteenth century was received differently and followed different courses in each of the three political divisions. In England and Wales the Church maintained its organization unbroken, simply severing its connection with Rome. The movement in Scotland was more radical, necessitating a new organization. In Ireland the native Irish element remained loyal to Rome, only the limited English population revolting. But while the respective churches which the Reformation left in power in the three kingdoms are still the predominant organizations, their majorities have been reduced, and the present religious status differs much from that of the earlier time.

The changes have been most marked in England and Wales. From the first there were dissenters (Nonconformists) from the state church; and the Presbyterians, Congregationalists (or Independents), and Baptists date from this early period. Just prior to the rise of Cromwell the Nonconformists had apparently secured considerable power; but the attempt to make the Presbyterian church the Established church (1648) failed. The Puritan element was dominant during Cromwell's rule. In the following reaction the ranks of the Nonconformists were much reduced, and it was not until the Methodist revival that they again became prominent. In 1700 it was estimated that the Nonconformists numbered less than one-twentieth of the English population. In the eighteenth century religious indifference settled upon the country, from which it was aroused by the preaching of Wesley and his Methodist following. Wesley himself remained a member of the state church and desired that his followers should not be separated from it; but divergence from the Established church was carried too far, and after his death the Methodists became organized (1795) as a separate body. The spirit of the movement was taken up in a degree by other bodies, and the older Nonconformist churches, particularly the Congregationalists, enjoyed a considerable growth in membership. Later there were a number of divisions within the Methodist church, but the Wesleyan Methodists, with a little over half of the entire Methodist following, are stronger than any other Nonconformist church. In the absence of any religious census the strength of the different elements is estimated upon some such basis as the percentage of marriages celebrated according to the rites of the different bodies.

In 1911, in England and Wales, the Episcopal rites were used in 61 per cent of the marriages, the Roman Catholic rites in 4.4 per cent, while the ceremonies in the registered places of other Christian denominations numbered nearly 14 per cent, and the civil marriages 20.9 per cent. It is estimated that the number of people not in the Established, Roman Catholic, or Jewish churches, who are therefore presumably Nonconformists in sympathy, is considerably over one-fifth of the total population. After the Methodists, the Congregationalists and the Baptists are strongest, the Presbyterians following with a much smaller number, the members of this church being most numerous in the northern counties of England. The Nonconformists strongly predominate in the northern counties of Wales, and attempts have been made to secure the disestablishment of the Episcopal church in Wales. The Roman Catholic church had remained small in England and Wales until the influx of the Irish in the famine years from 1845 on. More recently the Roman Catholics have secured many converts from the Established church. Their number is estimated at about 1,800,000. The Church of England, on account of its latitudinarian policy, retains widely diverse factions within its organization. Since about 1850 the High Church element, inclined towards a greater ceremonial, has become preponderant, while the Broad Church movement, which stands especially for a more liberal theology, has also grown at the expense of the old Low Church.

Presbyterianism is much stronger in Scotland than Episcopacy is in England. But the Episcopal and the dissenting churches in Scotland show a comparatively small increase. Latterly the Roman Catholics have grown in Scotland, and their number is estimated at about 550,000. However, Presbyterianism itself has undergone a number of schisms. The Established branch, though numbering over half of Scottish Presbyterians, contains less than half of Scottish Church communicants. When, after the union with England, Parliament gave lay patrons the right to present clergymen to vacant benefices, the ensuing dispute resulted, early in the eighteenth century, in two divisions, the seceding bodies afterward forming the United Presbyterian Church of Scotland; and finally in 1843 the same question caused another division from the Established church, which gave rise to the Free Church of Scotland. In 1900 this body joined the United Presbyterian branch under the name of the United Free Church of Scotland. Of the minor Presbyterian divisions the most important is the Reformed Presbyterian. Neither the Established church in England nor the Established Presbyterian church in Scotland receives any state financial aid. The support of the Episcopal church is secured mainly from the local endowments of the individual churches.

In Ireland the Celtic element has persistently stood by the Roman Catholic faith, but the early influx of Scottish Presbyterians and English Episcopalians and the very heavy emigration of the Roman Catholics in the nineteenth century have resulted in appreciably reducing the Roman Catholic percentage. The Episcopalians, who in 1911 numbered about 577,000, are mainly in the eastern portion of the island. The Presbyterians, numbering about 441,000, are confined largely to the northeastern part. There are about 62,000 Methodists.

Jews are not numerous in the United Kingdom, 245,000 being given as their number in 1915. They are confined to London and a few of the other large towns. The organization of the different denominations represented in the United Kingdom will be given under the respective titles of those bodies. See also IRELAND.

Education. The educational systems in England and Wales and in Scotland respectively have developed along widely divergent lines. The former had no public-school system until late in the nineteenth century, and its development then was hampered by religious controversy. Scotland provided for public schools before the close of the seventeenth century, and the system was free from religious interference. In earlier times a large number of endowments had been established in England, usually by some religious sect; but the instruction went little beyond the dead languages and was given to comparatively few. The administration of endowments was defective, and many endowments were lost or diverted into other channels.

Early in the nineteenth century an interest in general education was aroused mainly by two rival organizations: the British and Foreign School Society, dating from 1808, representing the dissenting religious elements; and the National Society (1811), representing the Established church. In 1816 and 1818, respectively, elementary education and educational charities were investigated by the government, but no money was granted them until 1833, when $100,000 was divided between the educational societies. Government inspection, subject to approval of each inspector by one of the rival factions, was the condition of receiving the grant. In 1856 an educational department was founded to administer the grant. The funds were distributed according to results of the examinations held by the inspector in reading, writing, and arithmetic. In 1869 the school accommodations were only half those required, though they had doubled during 1859–69. In 1870 the Elementary Education Act established the basis of the general educational system still in force. It applied to all children between 5 and 14. Other leading features were annual parliamentary grants to public and private schools on the same terms; a central administrative agency; wherever necessary, school boards to be elected and board or public schools to be established; in board schools no religious catechism to be taught, though religious instruction might or might not be given; in the voluntary schools religious instruction not to be forced upon a child if its parents objected. In 1872 a similar system was established for Scotland, but with elected school boards for every parish, and these in charge of both higher and elementary education. Scotland has its own central administrative board. In 1900 improved secondary and technical instruction in England was secured by uniting under a board of education the former separate department of education and science.

The Education Act of 1902, reactionary at some points, was at other points a great advance in the conditions prevailing since 1870. It caused acute political differences; it contributed to the overthrow of the Conservatives in 1905 and led to the introduction of the Birrell Education Bill of 1906, which caused great popular disapproval by its provision for support of the voluntary or religious schools by local taxes, while leaving their control with religious bodies. The Birrell Bill was withdrawn because the House of Commons refused to accept amendments made by the House of Lords. The voluntary or Church schools are mainly in rural regions or small towns and are most controlled by the Established church. In 1912 the number of voluntary schools in England and Wales was 12,704, with accommodations for 2,797,636 pupils, while the number of council schools was 8196, with accommodations for 4,065,240 pupils. Of the voluntary schools, 10,877 schools (2,227,431 pupils) were controlled by the Church of England, 1082 schools (377,859 pupils) were Roman Catholic, 214 schools (65,749 pupils) were Wesleyan, and the remainder were divided among various denominations, including the Jewish, or were undenominational. The chief benefit of the Act of 1902 was the substitution of an educational unit of administration (the county council) for the numerous bodies that enforced the Law of 1870. Thus two great features hitherto absent from the English system were obtained: first, a public authority charged with educational interests;

second, these councils have the power of coördinating every branch of education, elementary, secondary, and technical. They are empowered to levy taxes, may borrow money, and can turn over the control of each local school to a board of six managers, one of whom is appointed by the religious body furnishing the school building and equipment.

Education is now compulsory in both England and Scotland for the age period from 5 to 14, though total or partial exemption may be secured at the age of 11 in England and of 12 in Scotland. Kindergarten work is given a prominent place in the elementary system. Women may be elected members of the school boards. In England and Wales, on July 31, 1912, departments in the ordinary public elementary schools numbered 32,234; accommodations, 6,862,876; teachers, 41,307 men, 122,676 women; pupils enrolled, 3,044,384 boys, 2,992,986 girls; average attendance, 88.79 per cent. There were 51 higher elementary schools, with 464 teachers and 10,806 pupils (average during the year). In Scotland, for the year ended Aug. 31, 1912, there were 3164 public primary schools in receipt of grants, with accommodations for 1,042,703 pupils, 820,171 pupils enrolled, and 733,792 in average attendance; 196 higher grade schools in receipt of grants, with 24,544 pupils enrolled and 24,201 in average attendance; 1152 continuation classes, with 144,815 pupils. Teachers, including those in the higher-grade schools, numbered 5362 men and 15,096 women. In Ireland, on Dec. 31, 1912, public primary schools in operation numbered 8255, with 13,213 teachers, accommodations for 769,697 pupils, an enrollment of 668,974, and an average attendance of 499,038. The public schools for which statistics are here given must not be confounded with the many private English institutions known as the public schools.

Secondary and Technical Education.—The secondary public school is not thoroughly established. In England and Wales, on Jan. 31, 1912, there were 995 secondary schools recognized for grant, having full-time teachers 5106 men and 4974 women; part-time teachers 3326, and full-time pupils 89,004 boys and 76,613 girls. At evening and similar schools pupils enrolled in 1912 numbered 784,984; in day technical classes, 11,758; in technical institution courses, 1289; in art classes, 3250; in schools of art, 41,677 (20,359 males, 21,318 females). In Scotland, for the year ended Aug. 31, 1912, there were 56 secondary schools claiming grant, with 1175 teachers, 20,484 pupils enrolled (11,956 boys, 8528 girls), and 19,458 in average attendance. There is a large number of secondary schools maintained by private enterprise, endowment, subscription, etc. These schools emphasize distinctions based upon social caste, and some of them are very exclusive. In Wales each county has an educational council, and over all is a central board with powers of inspection and examination of the secondary schools. In Scotland school boards may establish secondary schools.

The Scottish provision for evening continuation schools is almost identical with that of England. In England and Wales there is no thoroughly defined system of technical instruction, although, through the assistance of special grants, manual training and the industrial arts and sciences are given much attention, while the municipalities have been active in building technical institutions. In Scotland technical schools may be established by school boards.

Universities.—Great Britain does not provide so amply for university education as do some other large European countries. Within the last few decades, however, the number, attendance, and influence of universities have increased. The new colleges are free from the traditional restrictions of Oxford and Cambridge, and their courses have better met the demands of science and local industries. London University, constituted an examining body in 1836, became also a teaching body in 1900, comprehending in 1913–14 over 30 colleges, with an enrollment of 5840. In 1878 colleges situated at Manchester, Leeds, and Liverpool were federated under the title of Victoria University. The Durham University, established in 1832, was extended in 1871 so as to include the colleges of medicine and science at Newcastle-upon-Tyne. Birmingham University was constituted in 1900. All of these, established first by private beneficence, now receive government aid. Birmingham rejected the widely adopted plan of affiliated collegiate institutions and was the first autonomous, compact, self-centred institution, similar to those of the United States and continental Europe. This institution was equipped for teaching, research, and examination from the first and was imitated in other large industrial cities. In 1903 the University of Liverpool was founded on the basis of the old college, which had been a constituent part of Victoria University. In the next two years Manchester, Leeds, and Sheffield followed this example and established independent universities. See articles on the universities of OXFORD, CAMBRIDGE, LONDON, WALES, ST. ANDREWS, GLASGOW, ABERDEEN, and EDINBURGH.

Charities. Charitable functions, at first exercised by the Church as a religious duty, were gradually taken over by the parishes, and when the towns and guilds became powerful they established charitable institutions for the benefit of their members. It was not until the Reformation, however, that the state began to deal with the problem of pauperism. The relief supplied formerly by the monasteries had to be replaced, so that during the reigns of Henry VIII and Elizabeth a general state policy was rapidly developed. By an Act of 1601 a regularly assessed poor rate became compulsory, laying the foundation principles of the poor-law policy. Children were provided for through apprenticeship, and adults able to work were compelled to do so, while to others relief was given. A law passed in 1723 made possible the establishing of workhouses and the application of the principle that those might be used as a test of need, and outside relief refused to the able-bodied. Many persons failed to adapt themselves to the changed conditions brought on by the industrial revolution in the beginning of the eighteenth century, and the pauper element rapidly increased.

The Gilbert Act of 1782, while creating the Poor-Law Union and introducing other administrative improvements, violated the workhouse test by making outdoor money aid possible. In 1795 this was further violated by supplementing the ordinary wage of the laborer with money aid, the amount of which was increased by the number of members in the family. These aids tended to weaken the sense of personal responsibility, a large portion of the agricultural laborers became pauperized, relief was expected, and disgrace no longer attached to it. In 1802–03, 28 per cent of the population in England and Wales received permanent or occasional aid. Conditions became very bad, and in 1834, as the result of the investigations of a parliamentary commission, measures were passed which marked a new epoch in poor-law administration.

A commission was established which became a permanent government department in 1867 and in 1871 was known as the Local Government Board. The board consists of a president appointed by the King and a number of ex-officio members. It not only enforces law but also issues orders and regulations. It establishes unions and determines district boundaries and exercises administrative and financial control over guardians. Assistant commissioners were appointed as agents, and later these were succeeded by inspectors. Auditors examine accounts and disallow improper expenditures, while guardians have absorbed most of the former functions of overseers and are the chief local officers of poor relief.

The unit of administration of the board of guardians is the poor-law union, a combination of parishes. Each parish selects one or more guardians, and these may choose two additional members. In the rural districts the poor law is administered by the district councilors. The most important of the appointed officers are the relieving officer, who investigates and deals immediately with the case at hand, the clerk, who is the secretary of the board, and the assistant overseers and collectors. While the poor rate is levied upon the parish, the cost of relief is defrayed from the common fund of the union. Provision is made for the combination of unions into larger districts for special purposes, as in the case of the maintenance of pauper institutions.

Since 1830 the policy pursued has been to limit relief as much as practicable to indoor methods. Asylums, infirmaries, and hospitals are provided for the classes needing such treatment as these institutions afford; schools and training ships for children; and workhouses for the able-bodied. In the care of children considerable progress has been made in the operation of the placing-out system.

The experience of Scotland has been much different from that of England, particularly in its lack of continuity. The Scottish Parliament passed laws for poor relief as far back as 1575, but compulsory taxes were not generally collected until the nineteenth century. An Act was passed in 1845 providing a system of poor relief, resembling that of England and Wales, which is still operative.

The mean number of paupers and the ratio per thousand of estimated population relieved on January 1 and on July 1 preceding (exclusive of casual paupers and insane) are reported as follows for England and Wales:

YEAR	INDOOR		OUTDOOR		TOTAL*	
	No.	Ratio	No.	Ratio	No.	Ratio
1900...	188,423	5.9	500,214	15.8	688,505	21.7
1905...	222,217	6.6	542,891	16.1	764,589	22.7
1910...	256,523	7.2	534,933	15.1	790,496	22.3
1914...	234,510	6.4	382,734	10.4	617,128	16.7

* Deductions are made from total for paupers who received both indoor and outdoor relief on the same day.

A number of paupers, especially outdoor paupers, ceased to be dependent on poor relief in 1911 in consequence of the partial removal of the pauper disqualification for old-age pensions.

In parishes in Scotland the poor of all classes (including lunatic poor) in receipt of relief on Jan. 15, 1914, were 66,832 paupers and 38,413 dependents. In unions in Ireland the number of paupers in receipt of relief at the close of the first week of January, 1914, was 74,841 (of whom 3915 were able-bodied adults receiving indoor relief). Throughout Great Britain private charity is very active and is thoroughly organized. There is a very clear distinction between state and private charities, and the two coöperate harmoniously. The state aims only to alleviate actual distress, regardless of its cause or the character of the individual, and it does not undertake to prevent poverty. Private charities cover a much wider scope, attending to many questions of public welfare, aiming to prevent and improve conditions that are not necessarily due to immediate distress.

Colonies. While directly after the repeal of the Corn Laws of 1846 many persons, both in the mother country and in the colonies, considered a complete separation of the colonies and Great Britain desirable and probable, since about 1870 the tendency has been towards a closer union of the various members of the British Empire. The mutual interest existing between the colonies rests not only upon a feeling of racial and cultural kinship, but upon such practical matters as trade and defense. The first important step taken to strengthen this bond was in the conference held at London in 1884 by the Imperial Federation League. Numerous conferences have been held since, and were given mainly to the discussion of closer Imperial coöperation and unity. For a statement of the varying methods of government and the area and population of the colonies, see BRITISH EMPIRE and the articles on the different colonies.

Government. The constitution of the United Kingdom is the result of long historical growth. It is more largely unwritten than that of any other country of western Europe. What is written is not in a single instrument, but is scattered through various acts of Parliament and solemn agreements from the Middle Ages to the present. The unwritten part consists of customs, maxims, and institutions which, in virtue of long acquiescence of the nation, have acquired the force of written law. The British constitution is not, therefore, the artificial creation of a single constituent body organized to incorporate in legal institutions the results of a violent and bloody revolution. See PARLIAMENT.

The House of Commons at present (1916) consists of 670 members, of whom England chooses 465, Wales 30, Scotland 72, and Ireland 103, and they are elected by secret ballot for a term of five years. The voter in an English county or borough must be a male citizen 21 years of age, a freeholder of the annual value of 40s., or a copyholder or leaseholder of the annual value of £5. But if he has no such interest in real estate he must be a householder of the annual value of £10 or a lodger of the same value. In Scottish and Irish counties the qualifications are substantially the same. The more important disqualifications relate to the holding of incompatible offices at the same time, conviction of certain crimes, and receipt of poor relief. Voters with sufficient property in different districts may vote in each district. Members are distributed according to population and are chosen by districts and on single ticket. Members of the House of Commons must be male citizens not under 21 years of age. Disqualified are English and Scottish peers, representative Irish peers, Roman Catholic priests, clergymen of the Established church, judges, sheriffs, and other returning officers, government contractors, bankrupts, and persons convicted of certain crimes.

The House of Lords consists of (1) English hereditary peers whose ancestors have received a royal summons to Parliament since 1295, or who have themselves received a patent of nobility in the United Kingdom; (2) 16 Scottish representative peers chosen for the term of Parliament by a majority of all the Scottish peers, i.e., those whose ancestors sat in the Scottish House of Lords before the union; (3) 28 Irish peers chosen for life by all the Irish peers; (4) 2 archbishops and 24 bishops by virtue of their office; and (5) 4 judicial members, known as Lords of Appeals in Ordinary, appointed by the crown for life. The full House (in 1915) would consist of 654 members. The crown may create an unlimited number of English hereditary peers, but this is not true of life peers and of Scottish and Irish peers. The only qualification for membership in the House of Lords is male sex, citizenship, and attainment of the age of 21 years, while bankruptcy and conviction of felonious crime disqualify.

The members of both Houses are privileged from arrest except for indictable offenses—the Commons during the session, and 40 days before and after, the Lords at all times. They cannot be questioned outside of Parliament for opinions expressed or votes cast in that body; but the courts have held (Stockdale and Hansard) that if the Commons have their speeches published and circulated they are amenable to the law of libel and slander as private individuals are. Up to 1911 members of neither House received pay for their services, except that an occasional constituency undertook to pay its member a salary. In August of that year a resolution of the House of Commons provided for an annual salary of £400 to members other than those already in receipt of salaries.

Parliament must assemble at least once in three years. It usually meets annually, in February, and remains in session until midsummer. It is summoned, opened, and prorogued by the crown and upon the advice of the Prime Minister. It is dissolved either by legal expiry of the term of the Commons or by order of the crown, with the advice of the ministry. Parliament has seldom lasted through its full term, dissolution usually resulting from the action of the crown. Dissolution ends the House of Commons without affecting the Lords, except the Scottish peers elected for the term of Parliament, while prorogation ends the session merely. Formerly the sovereign's death dissolved Parliament, but a recent law abolished this custom. Either House may adjourn for short periods of time independently of the other or of the crown. The internal organization of Parliament is left partly to the action of each House. Thus the Commons choose their own Speaker, although by custom the presiding officer in the House of Lords is the Lord Chancellor, a member of the ministry. But as he may be a member of the House of Commons, his seat is placed without the limits of the chamber in which the Lords hold their sessions. The other officers of Parliament are appointed by the crown. Over its discipline and procedure each House has full control, and may expel a member or punish an outsider for contempt. A quorum necessary for doing business is fixed at 40 in the British Commons and three in the Lords. The constitution places no legal limitations upon the power of the British Parliament. Its power, however, is a present one and cannot bind future parliaments. See LORDS, HOUSE OF; PARLIAMENT.

The executive power is, nominally at least, in the crown, which is legally and theoretically irresponsible, immaculate, and immortal. It is hereditary, according to lineal primogenial descent, with preference for males over females among brothers and sisters. The ruler must not be a Roman Catholic, must be a communicant of the Established church, and apparently by custom must be 18 years old before exercising the royal powers. At present the powers of the crown include the declaration of war; the negotiation of treaties; the appointment and reception of diplomatic officers; the issuance of passports; the command of the army and navy, with a large power over the appointment, promotion, and dismissal of officers, and the promulgation of rules for the government and disposition of the forces; the appointment of all the civil officers of the government and the removal of most of them; the appointment of the high clerical officers of the Established church, and full power of control over the ecclesiastical parliament or convocation; and the granting of pardons. The power of the crown in legislation has already been discussed in connection with the subject of Parliament. The power of the crown to veto all legislative measures passed by the Houses of Parliament has not been exercised since 1707 and has practically fallen into disuse.

As already stated, the crown is irresponsible. It therefore exercises its powers through a responsible ministry selected from the members of Parliament belonging to the political party which has a majority in the House of Commons. They are also the heads of the executive departments and members of the King's Privy Council. The King appoints the Premier, who is the leader of the party in power and who selects the other members of the cabinet from his own party. They may be members of either House, but commoners must resign their seats and be reëlected. The cabinet is an extra-legal institution, having never been recognized by act of Parliament; the names of the members are never officially announced to the public, and no record is kept of its meetings or acts. The size of the cabinet varies according to the prominence which certain interests are likely to assume in the Parliament. Strictly speaking, it need not, according to custom, include more than 11 members, viz., the First Lord of the Treasury, the Lord Chancellor of England, the Lord President of the Council, the Lord Privy Seal, the Chancellor of the Exchequer, the Secretaries of State for Home Affairs, for Foreign Affairs, for the Colonies, for India, and for War, and the First Lord of the Admiralty. To these may be added the President of the Local Government Board, the President of the Board of Trade, the Chief Secretary to the Lord Lieutenant of Ireland, the Lord Chancellor of Ireland, the Secretary for Scotland, the First Commissioner of Works, the President of the Board of Agriculture, the President of the Board of Education, the Chancellor of the Duchy of Lancaster, the Postmaster-General, and the Attorney-General. A minister of munitions and a minister of war trade were added to the cabinet after the outbreak of the great war. The legislative duties of the cabinet are to urge the adoption of government measures in the House of Commons and to defend the government's policy against the opposition, and for that purpose the members have seats in Parliament. It initiates public legislative measures and leads the majority in debate. The ministers are responsible to the Commons for their policy, and if defeated on any important measures, or if the House votes lack of confidence in them, they resign, and another ministry is formed from the new majority. If, however, the defeated cabinet think they still represent the popular will, they can ask the King to dissolve the House of Commons and order a new election. If the electorate pronounces against them, they must resign. Their responsibility is collective, and therefore they all go out together unless the conduct of a particular minister has been such that the responsibility for the objectionable policy may be fixed on him, in which event he alone resigns. This happened in 1851 in the case of Lord Palmerston, the Foreign Secretary, who was forced to resign.

In addition to their legislative functions the ministers act as heads of the various departments of administration. The Prime Minister usually takes the portfolio of the Treasury Department with the title of First Lord of the Treasury. There are few duties, however, attached to the First Lordship of the Treasury, the actual head being the Chancellor of the Exchequer, the chief financial officer of the government. He prepares annually and submits to Parliament the budget or statement of the estimated receipts and expenditures of the government for the ensuing year, together with suggestions for the increase or reduction of taxation in case of expected deficit or surplus. The duties of the Foreign, Colonial, War, and India secretaries are sufficiently clear from the names. The Secretary for Home Affairs supervises the police and certain local administration, advises the sovereign in the matter of granting pardons, and in part concerning labor legislation. The Admiralty administers naval affairs and is controlled by six lords. The Board of Trade supervises commercial, railway, marine, and statistical affairs, coinage, weights and measures, and the post office.

The judicial system has only two tribunals which are in any sense constitutional courts: the House of Lords and the Judicial Committee of the Privy Council. The House of Lords acts as a criminal court for the trial of peers, as a general court of impeachment, and as the highest court of appeal for the United Kingdom. In the last-mentioned capacity only the Lord Chancellor, who presides, the Lords of Appeal in Ordinary (four life lords of high judicial standing provided for by statute), and such members as have formerly held high judicial office, take part in the hearing. The jurisdiction of this court includes cases appealed from any appellate court in England, or from any court in Scotland or Ireland, from which appeals were allowed to the House of Lords previous to 1876. The Judicial Committee of the Privy Council is a court of last resort for India, the colonies, the Isle of Man, the Channel Islands, and the vice-admiralty courts abroad. Its personnel is substantially the same as that of the House of Lords when sitting as highest court of appeal. Apart from these tribunals the general courts of the Kingdom are the High Court of Justice and the Court of Appeal. The former consists of three sections, known as the Chancery Division, of six judges, the King's Bench Division, of 15 judges, and the Probate, Divorce, and Admiralty Division, of two judges. Appeals lie from this court to the Court of Appeal, a tribunal consisting of the Master of the Rolls, five justices, and the three presidents of the divisions of the High Court. The principal criminal courts are the petty sessions and quarter sessions, held by the justices of the peace; the assize courts, held four times a year in certain towns, usually by judges of the King's Bench Division; and the Central Criminal Court, which is the court of oyer and terminer and jail delivery for the city of London and surrounding territory.

The English system of local government is highly complex and difficult of explanation. The parliamentary Acts of 1888 and 1894 somewhat simplified the system. The more important local units are now counties, county boroughs, municipal boroughs, urban districts, rural districts, parishes, and school districts. The chief county officers are the Lord Lieutenant, the sheriff, the justices of the peace, the clerk, and the coroner. The Lord Lieutenant represents the crown in the county and is the keeper of the records. The sheriff, who formerly wielded large powers, is now a ministerial officer whose chief duties relate to the enforcement of the judgments of the courts and the holding of parliamentary elections. The justices of the peace were in 1888 stripped of most of their former administrative and financial powers by the Local Government Act of that year and are now chiefly judicial functionaries who attend to the preliminary investigation of all crimes. The Lord Chancellor appoints them upon nomination by the Lord Lieutenant of the county in which they reside. They try minor offenses without a jury. As a criminal court of first instance they all sit together in a court of quarter sessions, and without a jury they are a court of appeal from orders and decisions of justices acting individually or in petty or special sessions. They still retain some administrative duties, such as issuing liquor licenses, appointing overseers of the poor, and assisting in police administration.

By the Act of 1888 there was created in each of the 62 administrative counties (except the administrative county of London) into which England and Wales are divided a popularly elected County Council of councilors and aldermen, the latter selected by the councilors, usually from their own body. Councilors sit for three years, the aldermen for six, one-half their number retiring every third year. They all sit together under the presidency of a county chairman, chosen from the aldermen; he alone receives compensation. The powers and duties of the County Council include (1) care and administration of county property; (2) selection and supervision of most of the minor county officers; (3) assessment of rates and raising of loans; (4) management of highways; (5) granting of licenses to music and dancing houses; (6) control of the police (except in London) through a committee of the Council; and (7) a variety of other local matters. Like the similar county authority in the United States, the English County Council is restricted to enumerated powers.

Below the county is the district, either rural or urban. The Act of 1894 provided that each rural district should consist of a group of rural parishes, and its chief organ a council elected for three years by the parish assembly, and vested with administration of the poor law, the public health, and the highway acts. The urban district consists of a group of urban parishes in unincorporated boroughs, and, like the rural district, has a council with the same powers, except that the poor-law administration is left to a board of guardians. Below the district is the parish, urban or rural. In 1894 the rural parishes were reorganized, but the urban were only slightly changed. By that act every rural parish of not more than 300 people has a parish meeting, or assembly, at which every elector has the right to vote. Rural parishes of more than 300 people have also a parish council of from 5 to 15, elected for one year. The councils have taken over the civil powers of the old vestries, which after 1894 were ecclesiastical bodies merely, and besides have duties relating to charities, water supply, public health, highways, and other matters.

Incorporated towns, including county boroughs (i.e., boroughs which are treated somewhat as a county), are governed by a mayor, aldermen, and councilors, which together constitute a municipal corporation, known as the council. The councilors are elected practically by the ratepayers for three years, one-third retiring annually; the aldermen, by the council for six years, one-half retiring every third year; and the mayor by the council for one year. He alone is salaried, and is an ex-officio justice of the peace. The municipal corporation has only enumerated powers, substantially the same as the urban council, but provision is made for a separate quarter session and a separate police force.

London, by the Local Government Act of 1888, was made an administrative county with its own council, sheriff, and other officers. In 1901 the County of London, aside from the city, was divided into 28 metropolitan boroughs, each with its mayor, aldermen, and councilors, which take the place of the old parish vestries, formerly the chief local governing bodies of the metropolis.

The recent parliamentary legislation has shown a marked tendency towards greater central control over the local administration. The chief organ of supervision is the Local Government Board, created in 1871, the president of which is usually a cabinet minister. It can approve or disapprove many acts of the local organs, can audit the accounts of the local authorities, compel them to act in certain particulars, and to a certain extent can discipline local civil servants.

Scotland.—The government of Scotland, since the union with England in 1707, has been part of the general administration of Great Britain. The connection was maintained chiefly through the Home Office until 1885, when the office of Chief Secretary for Scotland was created, and duties previously discharged by different departments were transferred to the new office. The Chief Secretary is usually a cabinet minister, and the chief cabinet spokesman in the House of Commons in regard to Scottish business. The Lord Advocate, the chief law officer of the crown for Scotland, is the legal adviser of the crown in Scottish affairs. He serves as Attorney-General for Scotland, controls the whole criminal business of that country, also the preparation for Parliament of all Scottish bills, and is assisted by a Solicitor-General for Scotland, whose duties resemble those of the similar officer for England. Local government in Scotland is regulated chiefly by Acts passed in 1889 and 1894. By the former elective county councils were created similar to those provided for English counties in 1888. They took over most of the duties of the old county boards, the chief of which was the Commission of Supply. The Act of 1894, like the Act passed the same year in England, provided for an elective parish council in each parish to take the place of the old parochial boards and to exercise substantially the same powers as the English parish councils. The same Act created a local government board for Scotland, consisting of the Secretary for Scotland as President, the Solicitor-General, the Undersecretary for Scotland, and three other members appointed by the crown. Scottish municipal administration differs little from that of England. Some burghs have a little more local autonomy than others. The municipal officer corresponding to the English alderman is known in Scotland as the baillie, while the Scottish provost corresponds to the English mayor.

The Scottish Court of Sessions corresponds to the Supreme Court of Judicature in England. It is the highest Scottish civil tribunal, consists of 13 judges, and is divided into chambers and subdivided into divisions for the dispatch of business. The Supreme Criminal Court for Scotland is the High Court of Justiciary, consisting of all the judges of the Court of Sessions. It sits part of the time in Edinburgh and part of the time goes on circuit. Circuits are held twice a year, for which purpose Scotland is divided into three districts. For the trial of criminal cases, usually one judge with a jury of 15 men constitutes the court. The High Court has exclusive jurisdiction in cases of treason, murder, robbery, rape, and the other more serious offenses. The more important inferior courts of Scotland are held by county sheriffs, appointees of the crown, for a good behavior tenure. They have civil and criminal jurisdiction somewhat similar to that of the county courts and courts of quarter sessions in England, and cases tried by them with a jury cannot be appealed. For the government of Ireland, see IRELAND.

HISTORY

Development of Cabinet Government, 1688-1760. The legislative union of England and Scotland was formally consummated on May 1, 1707. There had been much opposition to the union in Scotland on account of the unwillingness of the English Parliament to grant a trade-union with equality of commercial privileges; but the threatening measures of the Scottish Parliament looking towards an absolute separation overcame this unwillingness, and Scotland was received as an equal in all respects, with a proportional representation in both Houses of the new British Parliament. Ireland was less fortunate. The Protestant Parliament there, in direct violation of the Treaty of Limerick, made the position of the Catholic population, which was the great majority, almost intolerable. The English Parliament, by forbidding the import of Irish meat and cattle into England, and the export of Irish woolen goods to any country other than England in 1699, effectually destroyed Irish trade. During the latter part of the reign of Anne the Tories, under the leadership of Harley

(Earl of Oxford) and St. John (Earl of Bolingbroke), ruled the country. The Tories did all they could to preclude their opponents from the possibility of future success. The Occasional Conformity Act and the Schism Act further disqualified Dissenters from voting or holding office. The creation of 12 new peers in 1711 gave the Tories a majority in the Lords and was a most important constitutional measure, since it demonstrated that in case of disagreement between the two Houses the Commons could always prevail by the creation of the requisite number of peers to constitute a majority. Harley and St. John even contemplated the restoration of the house of Stuart in order to prevent the Whigs from returning to power; but their plans were thwarted by the refusal of James the Pretender to declare himself a Protestant and by the sudden death of the Queen in 1714. The Treaty of Utrecht, which terminated the War of the Spanish Succession, gave Gibraltar and Acadia to England, together with Minorca, which was finally restored to Spain in 1783.

With the accession of the house of Hanover (or of Brunswick), in the person of George I, came a long supremacy of the Whig party, which was a combination of the great landed aristocracy with the industrial classes of the towns, while the strength of the Tories consisted in the support of the country gentry. The Whigs derived their strength from the boroughs, the more important of which numbered Dissenters among their industrial population, while the pocket boroughs, often inconsiderable hamlets, were either directly under the control of the neighboring magnates, usually Whigs, or else purchasable by them. As the Tories favored the house of Stuart, the first Georges were compelled to choose their ministers from the Whigs. They were more interested in their German than in their English possessions, and as long as they were supported by England in their continental designs they were quite willing to allow the English ministry to do as it pleased in regard to home affairs. The cabinet ceased to hold sessions in the King's presence, and by degrees his place as head of the council came to be filled by one of its members. This member was usually the guiding spirit of the cabinet. He chose the ministry and distributed the royal patronage. He and his ministry were responsible to Parliament alone.

The first act of the Whig Parliament of 1715 was the impeachment of Tory leaders for treasonable correspondence with the exiled house of Stuart. Oxford was sent to prison, Bolingbroke and Ormond fled to France. The rebellion of 1717, in favor of the son of James II, was easily suppressed in Scotland and northern England. In 1716 the same Parliament prolonged its power by an Act providing for septennial parliaments, and in 1719 it provided relief for the Dissenters by the repeal of the Occasional Conformity Act and the Schism Act. In 1720 a mad wave of speculation in shares of the South Sea Company swept over the country, based on exaggerated notions of the value of the trade with the Spanish colonies in South America. The ministry had allowed the national debt to be incorporated with the stock of the company, with a promise that the debt should be extinguished in 25 years, and when the bubble burst it was forced to resign. A partial relief for the sufferers was provided by the able administration of Sir Robert Walpole (q.v.), who was the virtual head of the new cabinet. For 21 years this astute man was the guiding spirit in English politics. By his ability as a financier he greatly promoted trade and commerce, and incidentally he made cabinet government a working system and caused the House of Commons to become more important than the House of Lords. He avoided exciting popular feeling, even withdrawing measures of undoubted excellence because of the prejudice against them; as, e.g., his Excise Bill in 1733, which provided for the regulation of import duties in government warehouses. With great reluctance he permitted the popular feeling in 1739 to involve the nation in the Spanish War, but resigned in 1742 rather than embark in a second war, that of the Austrian Succession. In his previous peace policy he had had the support of the nation, although he had never hesitated to maintain his majorities by making use of corruption. Carteret was the actual head of the next ministry, a short-lived one. His participation in the War of the Austrian Succession was indeed fortunate for Hanover, but brought neither glory nor profit to England. During this war occurred the daring invasion of the Young Pretender, Charles Edward Stuart. At the head of the Highland clans he gained a brilliant victory over the royal forces at Prestonpans in 1745 and advanced into England as far as Derby, but was finally forced to withdraw to Scotland and was overthrown at Culloden in 1746. In 1745 began the struggle between England and France for dominion in India.

After Carteret had been compelled to resign, and the great Whig family of Pelham had shown its incapacity, and the Duke of Newcastle had demonstrated his incompetence to rule by corruption, Pitt entered the cabinet in 1756. Although nominally a Whig, he was in reality above party ties. The middle class trusted him and formed his strongest support. He was hostile to France and took active part with Frederick the Great in the Seven Years' War, in which the French were deprived of Canada, which became English, and of Louisiana, as well as of their power in India. He resigned in 1761 because the cabinet refused to follow him in the declaration of war with Spain, which he considered inevitable. In the course of the Seven Years' War and the ensuing years Clive laid the foundation of a great British empire in India.

The Struggle against Democracy, 1760-1820. Meanwhile in 1760 George III had ascended the throne, with the fixed design of restoring as far as practicable the royal prerogatives which his two predecessors had allowed to slip from their grasp. He was determined to break up the party system as it then existed, to destroy the Whig oligarchy, and by selecting his own ministers exert a determining influence in English politics. Resuming the royal patronage, he had soon formed a party of adherents, the "King's friends," who looked to him for political guidance. Availing himself of dissensions within the Whig party, he forced Lord Bute, his favorite, into the cabinet as Prime Minister, but the latter showed incapacity and had to resign. At last the King found in Lord North a minister through whom he could carry out his ideas. Under the North ministry the American War of the Revolution was waged, and England, through stubborn adherence to her old colonial policy, lost her most valuable colonies. With the greatest reluctance the King allowed the Rockingham ministry, with Fox as its leading spirit, to be formed. He was opposed to Fox's grant of legislative independence to Ireland, and the actions of Shelburne, backed by the King's influence, caused the disruption of the ministry before the completion of the negotiations of the Treaty of Paris, 1783, conferring independence upon America. By his personal influence again the King overthrew the coalition ministry of Fox and North, and in the face of a hostile majority appointed the younger Pitt Prime Minister.

Although the King did not always approve Pitt's measures, they were agreed in the general policy to be pursued. Pitt's India Bill in 1784 reduced the power of the East India Company by submitting its political measures to the control of a commission named by the King. Although at first he was not in favor of the war against the French Republic, he soon became its principal advocate. He was joined by a majority of the Whigs, the most influential of whom was Burke. Fox, however, remained his opponent, arguing that the demands of the democracy should be met by reforms at home. The revolt in Ireland, in connection with this war, resulted in the Act of Union in 1800, but Pitt was compelled to resign because the King was unwilling to sanction Catholic emancipation in that country, which was one of the terms upon which Pitt proposed the union. He soon resumed power, however, and the war against Napoleon was prosecuted vigorously and with success. Nelson conquered at Trafalgar, and Wellington drove the French out of Spain. The Congress of Vienna allowed England to retain a large part of the territories (Cape Colony, Ceylon, British Guiana), gave her Mauritius, Tobago, and St. Lucia, and confirmed her in the possession of Malta, which she had wrested from the French in the course of the French wars. But while the war against Napoleon, simultaneously with which a less successful conflict was waged with the United States (1812–15), confirmed the naval supremacy of England, it entailed upon the country an enormous debt, at a time when the great body of common laborers were in dire distress as a first result of the industrial revolution that followed from the introduction of the spinning machine (1764), the weaving machine (1785), and the steam engine. For five years following Waterloo it was the policy of the government to suppress the unrest, while the masses, on the other hand, were threatening political revolt. In 1815 the first Corn Law, in the interest of the landowners, forbade the importation of corn until the price of the domestic product should rise to 10s. a bushel. In 1817 the Habeas Corpus Act was suspended; in 1819 occurred the Manchester Massacre, and the notorious Six Acts, by which meetings for the consideration of grievances were suppressed, were enacted. In 1820 George IV, who had been appointed Regent for his insane father in 1811, ascended the throne.

Democracy and Reform, 1820 till the Present Time. With the accession of Canning to the Foreign Office in 1822, England again entered upon a more liberal policy by opposing the Holy Alliance between Russia, Austria, and Prussia for the suppression of democracy. In 1824 she acknowledged the independence of the Spanish colonies. Assistance was afforded to the Greek patriots in their uprising against Turkey in 1827. In 1823, under Sir Robert Peel, an enlightened Tory, the criminal law was radically reformed by the abolition of the death penalty for about 100 crimes, most of which were trivial offenses.

The combination laws, which prohibited any workingmen's associations, were repealed in 1825, and thus the way was paved for the trades-unions that followed. In 1823 and again in 1825 the import duties were materially reduced. Both of these measures were brought about through the instrumentality of John Huskisson, President of the Board of Trade.

During its long exclusion from office the Whig party had changed from the close oligarchy of the eighteenth century and had become the advocate of democratic reforms. Lord John Russell, its most energetic leader, waged a long struggle in Parliament for liberal measures, and it was largely owing to his efforts that the Corporation Act and the Test Act, under which Catholics and Dissenters had been excluded from all corporate offices, were repealed in 1828 by a Tory ministry, headed by the Duke of Wellington. In 1829, in consequence of the O'Connell agitation for the separation of Ireland from Great Britain, Catholic emancipation was granted. At length, in 1830, a few months after the accession of William IV, the Whigs, by a fusion with the more advanced Conservatives (Canningites), returned to power with Earl Grey as Premier. His ministry was celebrated for the number of reforms it introduced. In 1831 Lord John Russell introduced the first Reform Bill in the House of Commons, which, after an appeal to the country, was indorsed by an overwhelming majority and, notwithstanding the opposition of the Lords, became a law in 1832. In its final form this law took away the franchises of 56 boroughs and reduced the membership of 32 others, distributing this representation among the larger towns and more populous counties, and it increased the number of voters from 430,000 to 650,000. By these measures it transferred the balance of political power to the middle classes of the towns.

In the next election the Ministerialists received an overwhelming majority. This majority was composed of two groups, the Radicals and the Whigs, who assumed the common name of Liberals. A number of important reforms were introduced. The number of bishops of the Established church of Ireland was reduced from 22 to 12, and certain ecclesiastical taxation was levied on the clergy, instead of being levied on the population at large. In 1833 slavery was abolished in the colonies, and a compensation of £20,000,000 was given to slaveowners. In the same year the first Factory Act, limiting the labor of children to eight hours a day, was passed through the efforts of Lord Ashley, and in 1834 the new Poor Law, abolishing outdoor relief and charity to the able-bodied, was enacted. The Liberal ministry of Lord Melbourne, which came to power in 1835, also enacted a Municipal Corporations Act providing for the election of corporations by the ratepayers, in place of the old method of self-election. In 1837 a rebellion in Canada gave occasion for uniting the provinces of Upper and Lower Canada into one province, under a new constitution which embodied the essentials of internal self-government. In 1838 the principles of the English Poor Law were extended to Ireland, and a Tithe Act was passed, levying the tithes on the landlord instead of on the tenants. During this reform period the foreign policy, which was directed by the brilliant Lord Palmerston, acted as a check on the absolute governments of Russia, Austria, and Prussia. His support of the Sultan of Turkey against Egypt, however, brought about an estrangement with France. With the accession of Queen Victoria in 1837 the Kingdom of Hanover, not allowing a woman to occupy the throne, became detached from England.

In 1839 the Chartists (see CHARTISM), a body of radical reformers, presented to the House of Commons their petition for manhood suffrage, vote by ballot, annual parliaments, the abolition of property qualification, the payment of members, and equal electoral districts. In 1841 the new Conservative party came to power under Sir Robert Peel. It was composed of the Tories and of the more conservative Whigs under the leadership of Lord Stanley, afterward the Earl of Derby, who had left the Liberal party. By anticipating the plans of the Liberals the Conservatives sought to make reforms, but in accordance with their own principles. In 1842 and 1845 Peel further reduced the protective tariffs, providing an income tax to meet the ensuing deficiency in the revenue. The conditions of women and children employed in the mines were improved by the efforts of Lord Ashley in Parliament. In consequence of the spirited campaign against the Corn Laws by the Anti-Corn-Law League, which was headed by Richard Cobden and John Bright, and under the stress of the Irish famine, Peel went so far as entirely to repeal the import duties on corn in 1846. In this measure he was supported by the Liberals, but opposed by the majority of his own party, which represented the land interests. He was consequently overthrown; but the Liberal ministry of Lord John Russell, which followed, introduced no measures of importance, either to relieve the tenant farmers in Ireland or to enlarge the suffrage in accordance with the demands of the Chartists in England. The foreign policy of all reform ministries had been one of hostility to Russia. The invasion of Afghanistan in 1839, intended as a measure against Russian aggression, resulted in the disastrous retreat from Kabul and the annihilation of a British army in 1842—a humiliation in a measure retrieved by the subsequent successes of the British. England's alliance with France in the Crimean War (1854–56), by which Russian aggression against Turkey was checked, was actuated by the same motives. The leading statesman identified with this aggressive policy was Lord Palmerston. In the early part of the reign of Victoria the British Empire in India expanded with giant strides, Sind, the Punjab, and Oudh being annexed between 1843 and 1846. The Opium War with China (1840–42) gave Hongkong to England. In 1857 occurred the terrible mutiny of the Indian Sepoys, the native troops in British employ. On the suppression of the mutiny Parliament put an end to the authority of the East India Company by making India a crown colony. Its Governor-General (henceforth Viceroy) was brought directly under the British monarch.

During the third Derby ministry Disraeli, its real leader, carried the Second Reform Act, by the aid of the Liberals, in 1867. This Act established, practically, household suffrage in the towns, thus giving to the workingmen a voice in political affairs, and greatly enlarged the suffrage in the country. The first ministry of Gladstone, which followed (1868–74), resembled the ministry of Earl Grey in the number of reforms it inaugurated. The attempted Irish revolutions of 1848 and 1867 (see FENIAN SOCIETY) had convinced Gladstone of the necessity of the redress of Irish grievances. In 1869–71 the Irish church was disestablished and disendowed. A Land Act in 1870 compelled landlords to compensate tenants for improvements in cases of eviction and provided for government loans to tenants wishing to buy their holdings. Forster's Education Act provided for national primary schools and for compulsory attendance, in place of the public aid which had previously been given to private institutions. The purchase of positions in the army was abolished in 1871, and the Ballot Act of 1872 instituted secret voting at elections. Gladstone's foreign policy was weak but pacific. He allowed Russia to abrogate her treaty obligations guaranteeing neutrality in the Black Sea, and he settled the *Alabama* claims by the payment of $15,000,000 to the United States, in accordance with the decision of a court of arbitration which sat at Geneva in 1871.

The second ministry of Disraeli (1874–80), on the other hand, was noted chiefly for its aggressive foreign policy. He had Queen Victoria proclaimed Empress of India in 1877. His interference robbed Russia of the fruits of her victory over Turkey in 1878 and secured Cyprus for England, and in the same year he made war upon Afghanistan, whose sovereign was leaning towards Russia. In Africa a controlling interest in the Suez Canal was acquired, the Transvaal was annexed (soon, however, to be set free), and the Zulus were subdued. In his second ministry (1880–85) Gladstone also was compelled to extend the Empire by suppressing the revolt of the native Egyptians under Arabi Pasha against the dual control of the finances of Egypt by France and England. As a result of this war Egypt came under British control. Forster's Land Act of 1881 provided for free sale, fair rents, and fixity of tenure in Ireland, and the Third Reform Act in 1884 gave to the country the universal suffrage already practically established in the towns.

Subsequent legislation has been largely democratic in character. The local government measures (1888, 1892, 1899) took the local government out of the hands of the gentry by the establishment of county councils (q.v.) elected by the people. Under this act Greater London at last received the self-government it had so long deserved by being organized as a county. The proposed Home Rule acts were a result of the demands of the great majority of the Irish people under the leadership of Charles Stewart Parnell. Gladstone's first act, in 1885, was rejected by the Commons, and caused the disruption of the Liberal party. A strong minority, under the leadership of Lord Hartington and Joseph Chamberlain, revolted and, assuming the name of Liberal Unionists, joined the Conservatives. Gladstone's second Home Rule measure (1895) was accepted by the Commons, but rejected by the Lords, and the next general election returned the Conservatives to power with Salisbury as Premier. The aggressive policy of Joseph Chamberlain, the Colonial Secretary, involved the nation in a bloody war with the two Dutch republics of South Africa in 1899. (See SOUTH AFRICAN WAR.) The struggle which opened with serious British reverses nevertheless ended in the subjugation of the Boers. In the course of this struggle Queen Victoria died, Jan. 22, 1901, and was succeeded by her son, Edward VII.

In 1902 a new Education Bill was enacted in spite of violent opposition on the part of the Liberal and Nonconformist elements aroused by the extensive favors the new measure conferred on the Anglican denomination. In 1903 a Land Act for Ireland was passed, providing the sum of £100,000,000 for distribution in the form of long-term loans to tenants for the purpose of enabling them to acquire ownership of the land they occupied.

In 1903 Joseph Chamberlain injected a momentous question into the sphere of party politics by bringing forward suggestions for an alteration in the fiscal arrangements of the country, equivalent to the abandonment of the time-honored system of free trade. For the purpose of bringing about closer relations between the United Kingdom and its colonies so as to enable British interests more effectually to compete with the growing rivalry of Germany and the United States in the commercial field, as well as to establish an effective system of Imperial defense, he proposed that, in exchange for preferential tariff treatment of British manufactures by the colonies as against foreign manufactures the United Kingdom should impose a duty on food imports from foreign countries and admit colonial produce free. The tariff question was debated extensively in Parliament throughout 1904 and 1905 with no other result than that of emphasizing the unpopularity of Chamberlain's views. In December, 1905, the Balfour cabinet found its position untenable and resigned. A Liberal ministry was organized by Sir Henry Campbell-Bannerman (q.v.), who immediately thereafter appealed to the country. The general election of January, 1906, was fought out on the issues of tariff reform, repeal of the Education Bill of 1902, and the policy of the Unionist government in the matter of admitting Chinese labor into the Transvaal, and resulted in an overwhelming defeat for the Unionist party, the Liberals receiving a majority of over 300. In April, 1906, the government introduced an Education Bill which dealt radically with the question of religious instruction in the schools and in a spirit acceptable to those who had opposed the bill of 1902. The measure was passed by a large majority in the House of Commons, but in the House of Lords it was bitterly assailed by the Anglicans and so radically amended that it was dropped, not, however, without producing strained relations between the Lords and the government and agitation on the part of the Radicals for the abolition of the Upper House.

In the sphere of foreign politics British prestige, which had suffered badly in the course of the South African War, reached a higher point than ever in the three years following the conclusion of peace with the Boers. In the East Great Britain appears as the ally of triumphant Japan, with which treaties were concluded in 1902 and 1905. (See **Japan**.) Its position in India was strengthened by the second of these two treaties, by the confirmation of treaty relations with the Ameer of Afghanistan in 1905, and the establishment of trade relations with Tibet (q.v.) in 1904. Its position in Egypt was improved by the agreement of April 8, 1904, with France, in which the latter power gave its consent to the indefinite continuance of the status quo, and by the enforcement of British claims to the Sinai territory against Turkey in 1906. The agreement of 1904 with France was of primary importance for European politics also as marking the establishment of peculiarly intimate relations between the two Powers in their opposition to German policy.

The strained relation between the government and the House of Lords continued unabated, and in 1907 the government resolved that the powers of the Lords in rejecting and delaying legislation ought to be checked. The same year Herbert Henry Asquith, in preparing the budget, reduced the tax on incomes directly earned in comparison with that on incomes derived from real property and from investments. When Campbell-Bannerman died, in 1908, and was succeeded by Asquith, there was another failure to pass an Education Bill, and although the Lords agreed to an Old Age Pension Bill, which had been formerly promised by the Unionists, they rejected a bill from the Commons for reducing by one-third the number of houses licensed to sell intoxicating liquors. In 1909 David Lloyd-George, the new Chancellor of the Exchequer, in preparing a budget that would enable England to meet the increasing naval efficiency of foreign powers, greatly increased the tax on liquor licenses, increased the tax on incomes exceeding £5000 a year, and laid a tax on land calculated to appropriate to the use of the state a portion of the unearned increment. The Lords, accepting this budget as a challenge, threw it out. The government went twice to the country in 1910 with the issue and was sustained each time. The same year Edward VII, who was one of the most sagacious occupants of the English throne since William III, died and was succeeded by George V. In 1911 the House of Commons, considering itself authorized to settle its difficulty with the House of Lords, passed a Parliament Bill depriving the Lords of practically all power over money bills and providing that any other bill which passes the House of Commons unchanged in three successive sessions of the same or successive parliaments does not require the assent of the Lords to become a law. The Parliament Bill passed the Lords under a threat to create new peers if necessary, and the first important measures to pass into laws under the operation of this somewhat revolutionary Act were a Bill disestablishing the Anglican church in Wales (1914) and a Home Rule Bill for Ireland 1914). (See *Government*.) To meet the threatening violent opposition to the latter Act by the Protestants of Ulster the House of Commons passed in 1914 an Amending Bill allowing the electors of each county of Ulster to decide whether or not their county shall be excluded from the operation of Home Rule for a period of six years. Another part of the radical programme of the Liberals was the National Insurance Bill, passed in 1912, and providing both national health insurance and unemployment insurance. For several years the militant branch of the woman's suffrage movement had been a disturbing factor in political and social England, but apparently without enhancing the cause.

The great war which began in 1914 came at a most inauspicious moment for the United Kingdom. Ireland was on the verge of civil war, the army was in a poor condition, and the vast increase in naval appropriations, together with the disagreement with the colonies over the naval policy, presented serious internal problems. A Suspensory Bill was passed which suspended from operation the Home Rule Act and the Welsh Disestablishment Act until 12 months from the passage of the acts or "until such later date (not being later than the end of the present war) as may be fixed by His Majesty by Order in Council." In 1915 the operation of the Acts was definitely suspended until the close of the war. War measures were passed providing for authorization of war credits; a Defense of the Realm Act, aimed against espionage; government control of the railroads and a strict censorship of the press.

Three great problems faced the British government in 1915, viz., finances, supply of munitions, and the recruitment of the army. (For a full treatment of the first of these, see WAR IN EUROPE.) By April, 1915, 750,000 men of "Kitchener's Army" had been sent to the front. However it was soon evident that Great Britain was not supplying enough men to meet the task assigned her in western Europe. Conscription, as opposed to volunteer enlistment, was proposed by many prominent men, although the cabinet seemed loath to take it up. The last three months of 1915 witnessed a great campaign for recruits, known as the Derby Recruiting Campaign. It was conducted by Lord Derby[*] and was the final effort of the government to avoid forcing conscription on the unwilling workmen. Lord Derby estimated that his campaign yielded 831,062 men. In January, 1916, the Military Service Bill was introduced, which provided that all bachelors and widowers (having no children dependent on them), between the ages of 18 and 41, were liable for military service. Ireland was excluded. The Laborites and Miners' Federation were bitterly opposed to the Bill. It was passed by a majority of 4 to 1 on its first reading. Premier Asquith postponed action on the Conscription Bill until May, 1916, when it was again introduced, and passed.

The supply of munitions was undeniably inadequate to meet the needs of the new army, although the rate of production was rapidly increased. Agreements were made with the labor unions by which semiskilled and female labor could be used without any discriminations against the unions. The government took over the control of all factories which were capable of producing war munitions. Nevertheless strikes and lockouts caused serious losses of time and supplies. A Munitions Act was passed which provided for government supervision of all manufacturing and which made strikes and lockouts illegal and proposed government arbitration for all disputes.

In May, 1915, a cabinet crisis occurred over the quarrel between Winston Churchill, First Lord of the Admiralty, and Lord Fisher, First Sea Lord. The result was the formation of a coalition cabinet. Eight members of the cabinet were asked to resign, and eight Unionists were brought in. Two new positions were created. (See *Government.*) The new cabinet consisted of 12 Liberals, 8 Unionists, 1 Labor member, and Lord Kitchener, who lost his life on June 5 when the *Hampshire* was lost off the Orkney Islands. In the course of the year Winston Churchill and Sir Edward Carson resigned. In December, 1915, Parliament introduced a Bill to prolong its life for 12 months. By a later compromise this was reduced to eight months.

In April, 1916, a serious outbreak occurred in Ireland. It was presumably engineered by Sir Roger Casement[†] in Germany. He was captured as he was about to land in Ireland from a German vessel, tried by court-martial, and sentenced to death. The Irish organization behind the revolution was the Sinn Fein (the Celtic equivalent for "ourselves alone"). It is a revival of the Young Irish movement of 1848 and opened a branch in New York City in 1907. It is a society whose purpose is purely national and is opposed to Home Rule for Ireland on the grounds that it is too conservative. Being nonsectarian, it hoped for an Irish republic which would appeal both to the Irish Catholics and the Ulster Protestants. The rebels seized many buildings in Dublin, and several insurrections broke out in other parts of the country. Martial law was declared and troops were immediately sent over from England. After several days of street fighting and the destruction of many buildings, the government troops were in control of the situation. Some of the leaders were taken to England, tried by court-martial, and shot.

As a result of the activities of spies, and in consequence of the violent popular excitement caused by German Zeppelin raids and submarine warfare, a strong tide of anti-German feeling swept over the British Empire. For the diplomatic, military, economic, and financial aspects of the war, see WAR IN EUROPE.

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[*] Edward George Villiers Stanley, seventeenth Earl Derby, born (1865) in London; educated at Wellington College; lieutenant, Grenadier Guards (1885–95); aid to the Governor General of Canada (1889–91); in South Africa as chief press censor and private secretary to Lord Roberts (1899–1901); a Lord of the Treasury (1895–1900); Financial Secretary to the War Office (1900–03); Postmaster-general (1903–05); member of Parliament (1892–1906); took seat in House of Lords (1908); appointed director of recruiting (1915); Undersecretary for War (1916).

[†] Sir Roger Casement, born in 1864; held consular offices in various parts of the world and in 1909–13 was British Consul General at Rio de Janeiro; during the early part of the European War made sensational anti-English utterances, and was suspected of plots to aid Germany and gain German help for an "emancipation" of Ireland; escaped to Continent and reward of £5000 was offered by British government for his arrest.

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UNITED METHODIST FREE CHURCHES. See Methodism.

UNITED MINE WORKERS OF AMERICA. See Mine Workers of America, The United.

UNITED PRESBYTERIANS. See Presbyterianism and the Presbyterian Churches.

UNITED PROVINCES. See Netherlands.

UNITED PROVINCES OF AGRA AND OUDH, formerly Northwestern Provinces and Oudh. A province of British India, in the Upper Ganges valley (Map: India, D 3). Total area, 107,267 square miles, of which 83,109 belong to the Territory of Agra, 24,158 to Oudh. They surround the native states of Garhwal, 4180 square miles, and Rampur, 899 square miles. Except the extreme northern part, which is a wild and elevated mountain region of the Himalaya, the province is a low alluvial plain watered by the Ganges and its numerous large parallel tributaries, chief of which is the Juma. The climate is hot and unhealthful, especially in the large jungle region below the mountains. The soil is fertile, but the western and southern parts of the province have a very uncertain rainfall, and are subject to severe droughts, so that these regions would be practically a desert were it not for many large streams.

Extensive irrigation works have been constructed. The total area cropped in 1912–13 was reported as 44,431,737 acres, of which 9,646,374 acres were irrigated. The area irrigated by wells was 5,514,379 acres and that by government canals 2,234,207 acres, the latter being entirely in Agra. The principal crops are of more nearly equal importance than in the other provinces. The United Provinces rank next to the Punjab as a wheat producer, the area under wheat in 1912–13 being 7,442,486 acres. Rice, though of much less relative importance than in Bengal and some other parts of India, covered 6,812,004 acres. Other acreages in 1912–13 were: barley, 4,643,334; grain, 5,507,486; spiked millet, 2,617,439; great millet, 2,169,370. The United Provinces have an area under sugar cane nearly four times as large as that of the Punjab, which stands second, the area under sugar cane in the former being, in 1912–13, 1,424,064 acres and in the latter 367,373 acres. Other crops include maize, cotton, opium, and indigo. The people eat little animal food, and stock raising is of subsidiary importance. Cattle and buffaloes take the place of horses. Mining is of little value.

Modern methods of manufacturing have been seldom adopted. For 1912 there were reported 201 factories, with 54,803 employees (of whom 6328 were women, 1693 children). The more important factories are cotton mills, especially in Cawnpore. The Ganges affords a means of water transportation. The province is better supplied with railroads than any other in India. It exports large quantities of oil seeds, wheat, raw cotton, hides, sugar, indigo, and opium, and imports cotton goods, metals, railroad materials, coal, and salt. A frontier trade is carried on with Tibet and Nepal.

The United Provinces are under the administrative control of a Lieutenant-Governor, appointed by the Governor-General, with the approval of the crown. There is a legislative council of 50 members (21 official, 27 unofficial, 2 experts). The provinces are divided into municipalities and districts administered by boards, a large part of whose membership is elective. The police force in 1912 had a sanctioned strength of 35,926 officers and men. The capital of the United Provinces is Allahabad.

The population of the United Provinces was

46,905,512 in 1891, 47,692,277 in 1901 (increase 1.7 per cent), and 47,182,044 in 1911 (decrease 1.1 per cent). Agra in 1911 had 34,624,040 inhabitants, and Oudh 12,558,004. The population of the United Provinces native states was 792,491 in 1891, 802,097 in 1901 (increase 1.2 per cent), and 832,036 in 1911 (increase 3.7 per cent). In the United Provinces and the native states respectively, Hindus numbered, in 1911, 40,253,433 and 583,599; Mohammedans, 6,658,373 and 246,358; Christians, 177,949 and 1745; Jains, 75,427 and 308; Sikhs, 15,160 and 26. There are more large cities in the United Provinces than in any other division of British India. City populations, with cantonments, were as follows in 1911: Lucknow, 259,798; Benares, 203,804; Agra, 185,449; Cawnpore, 178,557; Allahabad, 171,697; Bareilly, 129,462; Meerut, 116,227.

UNITED STATES. The order of treatment and scope of the article are indicated by the following main topics: Natural Features, Climate, Flora, Fauna, Geology, Soils, Fisheries, Mineral Resources, Agriculture, Manufactures, Transportation, Commerce (Foreign and Domestic), Shipping (Foreign and Interior), Government, Finances, Army, Navy, Population (including Interstate Migration, Sex, Density, etc.), Religion, History. Much of the material is treated to a greater extent and in more minute detail in other parts of the work under separate headings. Adequate cross references are provided throughout, which should be followed up should the reader desire to make a more exhaustive study of the whole subject or any one phase of it.

The territory of the United States of America, exclusive of Alaska and colonial dependencies, lies in the temperate portion of North America, but reaches to within one degree of the tropical zone. It extends approximately from long. 67° to 125° W. from the Atlantic Ocean (whose great arm, the Gulf of Mexico, forms half of the southern boundary) to the Pacific. The northern boundary is somewhat arbitrary in the east between New England and the lower St. Lawrence region, but from northern New York it follows the St. Lawrence and the middle line of the Great Lakes to northern Minnesota. Beyond the Lake of the Woods the boundary follows the 49th parallel to the Pacific Ocean. Key West, the southern point of Florida, has a latitude of 24° 33′, and the southern part of Texas about 26°, north latitude. The parallel 49° is about that of Paris, while the latitude of Key West carries one far south into the Sahara. It may be further observed that New York is on the parallel of Naples and Constantinople, and Memphis on that of Gibraltar. The length of the boundary of the United States proper is given by the Coast and Geodetic Survey as 10,758 miles. This is divided as follows: Atlantic Ocean, 1883; Pacific Ocean, 1316; Gulf of Mexico, 1639; Canada, 3900; Mexico, 1975. The country has preponderatingly a natural boundary of salt and fresh waters. On the side of Mexico and of British Columbia the boundary crosses the Cordilleran ranges. The land and water area of the United States proper and its noncontiguous territory is shown by preceding figures. This article treats of the United States proper except when otherwise stated. Alaska and also the colonial dependencies (see *Colonies*) are treated under their respective heads.

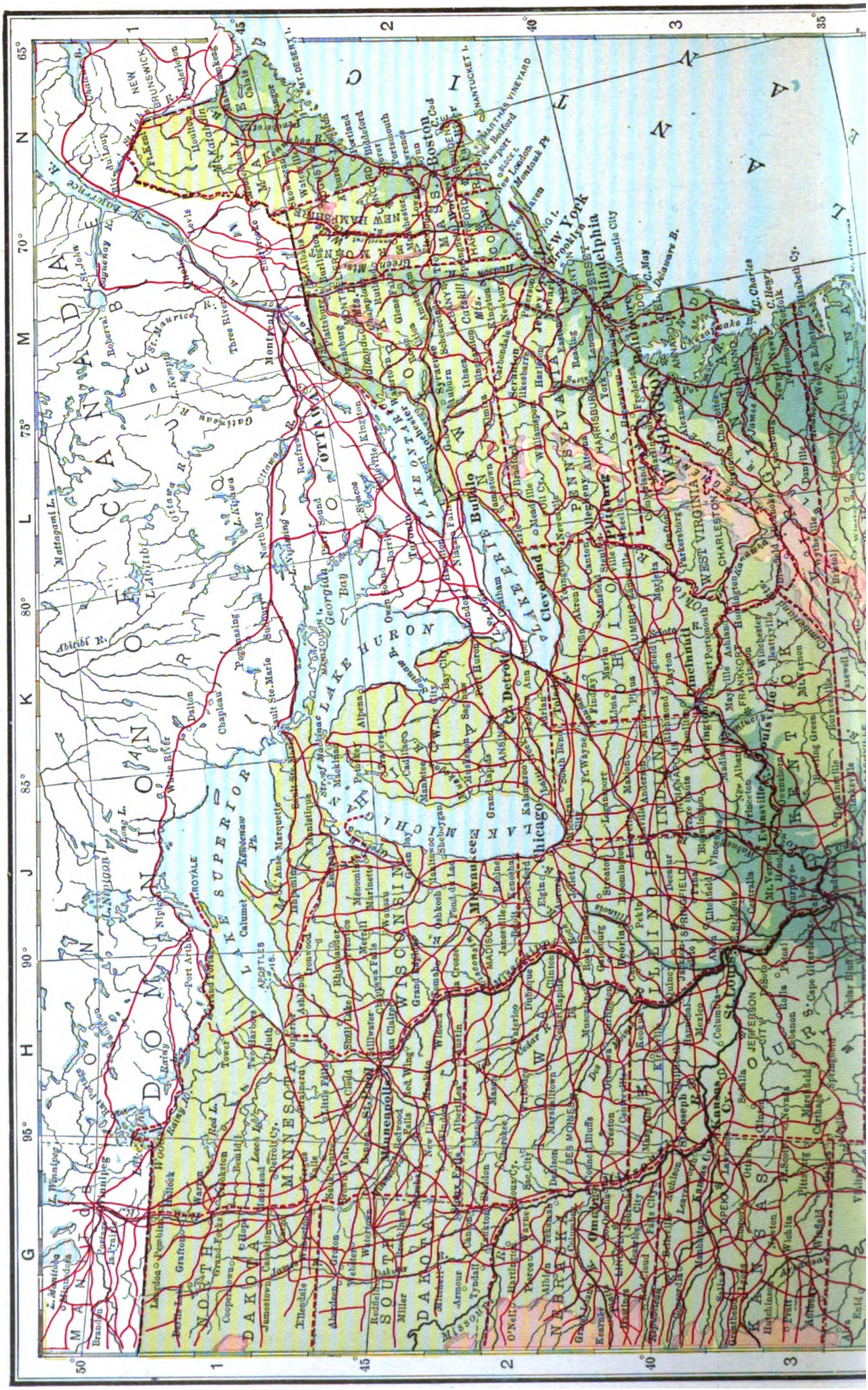
	Sq. miles
Continental United States	3,026,789
Alaska	590,884
Hawaiian Territory	6,449
Porto Rico	3,435
Philippines (estimated)	115,026
Guam	210
Samoa	77
Panama Canal Zone (leased)	448
Total	3,743,318

NATURAL FEATURES

General Description. The lands of the United States are crossed from north to south by the four principal physiographic provinces of the North American continent: (1) on the east, bordering the Atlantic, coastal plains and plateaus; (2) west of these, the Appalachian highlands extending from the Gulf of Mexico into Labrador; (3) a great system of plains and plateaus extending from the Gulf of Mexico northward to the Arctic, bordered on the east by the Appalachians and on the west by the Rocky Mountains; (4) a group of mountain chains and ranges on the west side of the country, including the Rocky Mountains, Sierra Nevada, Cascade, etc. (called the Cordilleras). These western highlands are so prominent and so extensive that the United States may be viewed as divided into two parts by the 100th meridian—the eastern part being a lowland plain with slight elevations in the Appalachian system, and the western standing at an elevation of 4000 to 6000 feet, with large areas over 10,000 feet.

Atlantic Lowland.—This region, although not large, contains a vast population and is historically the most important. It made the interior of the continent accessible to discovery from the east, offered hospitable ground to the colonists, and in the north is rich in the harbors that have led to the building of cities and the growth of commerce. The Atlantic lowland includes the piedmont plain. The latter extends south from New York to Florida Strait, including southern New Jersey, Delaware, and a broad belt of all the South Atlantic States. It is a smooth land, without projecting masses of rocky hills, and slopes gently up from the tide levels to the rougher lands of the Appalachian belt. It is intersected by Delaware and Chesapeake bays and their rivers and by more southerly streams. It is often known as the tidewater country because the sea enters its estuarine rivers for scores of miles. It is covered with fields of tobacco, cotton, rice, and fruit orchards or with pastures or native forest. The region is in greater part a sea bottom uncovered at a comparatively recent period and becomes continuous, beneath the Atlantic waters, with the continental shelf which lies between the land border and the deep seas. North of New York in New England and west of this plain is a much denuded belt of ancient Appalachian mountains which is known as the piedmont plain. New England, which is generally treated as a distinct physiographic province, is a rough lowland rising from sea level to the height of 400 or 500 feet. It is naturally dissected, upland country. By the piedmont plain is usually understood the land between the coastal plain and the Blue Ridge. See PIEDMONT PLAIN.

One feature of the entire Atlantic coast is that the rivers are tidal. They may occupy narrow channels to the sea border, like the Hudson, or they may enter at the head of deep and spacious bays, as do the Delaware and the Susquehanna. Such a water system with the above rivers, the Potomac, James, and other streams,


DOMINION OF CANADA
MANITOBA
ONTARIO
QUEBEC
NEW BRUNSWICK
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
LAKE ONTARIO
Georgian Bay
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
MINNESOTA
IOWA
MISSOURI
WISCONSIN
MICHIGAN
ILLINOIS
INDIANA
OHIO
KENTUCKY
WEST VIRGINIA
VIRGINIA
PENNSYLVANIA
NEW YORK
NEW JERSEY
MAINE
NEW HAMPSHIRE
VERMONT
MASS.
CONN.
ATLANTIC
OTTAWA
Montreal
Quebec
Toronto
Buffalo
Cleveland
Detroit
Chicago
Milwaukee
Minneapolis
St. Paul
St. Louis
Kansas City
Omaha
Des Moines
Indianapolis
Cincinnati
Louisville
Columbus
Pittsburg
Philadelphia
New York
Brooklyn
Boston
Baltimore
WASHINGTON
RICHMOND
Winnipeg
Duluth
G
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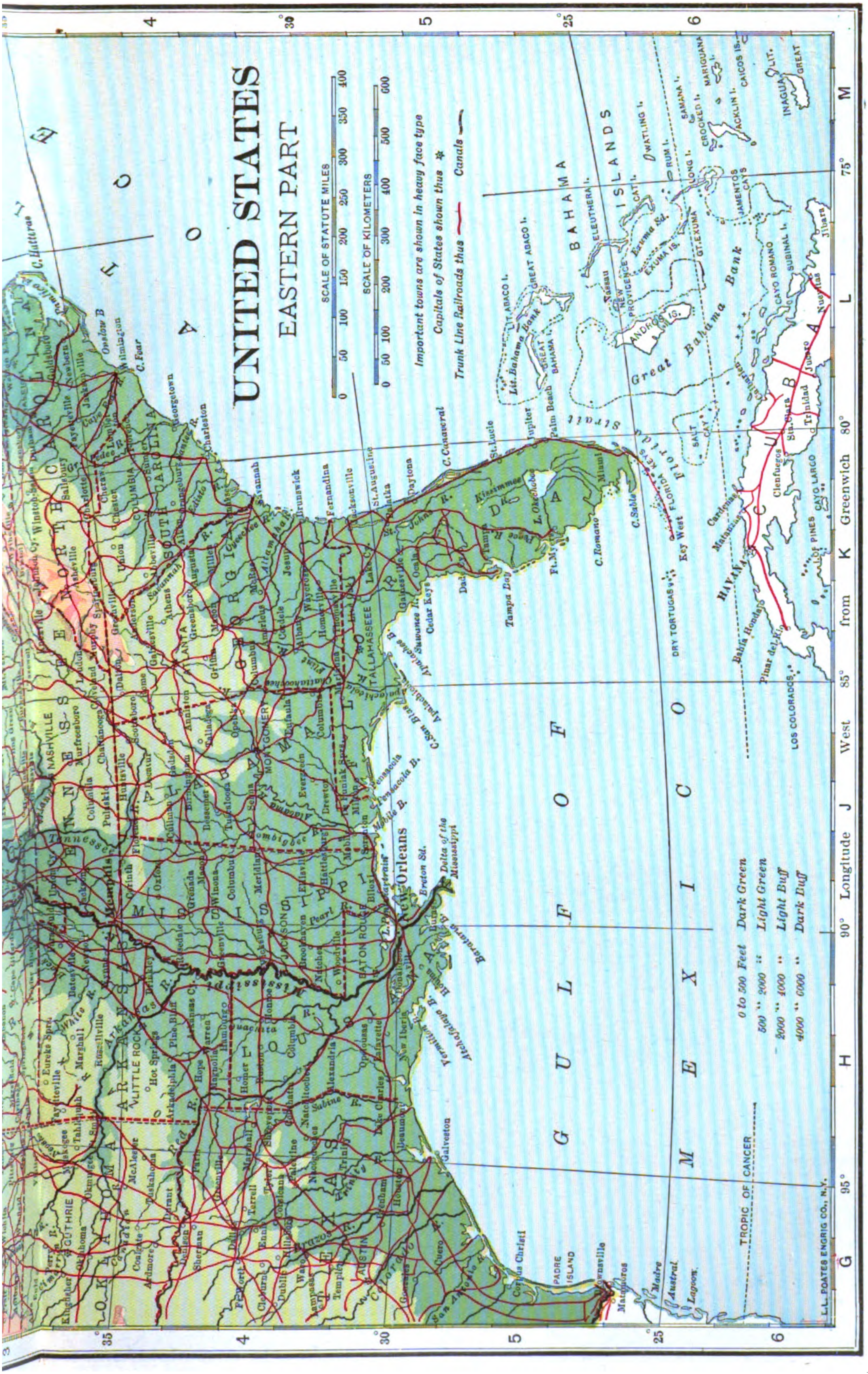

UNITED STATES
EASTERN PART
SCALE OF STATUTE MILES
0 50 100 150 200 250 300 350 400
SCALE OF KILOMETERS
0 50 100 200 300 400 500 600
Important towns are shown in heavy face type
Capitals of States shown thus ✲
Trunk Line Railroads thus
Canals
0 to 500 Feet Dark Green
500 " 2000 " Light Green
2000 " 4000 " Light Buff
4000 " 6000 " Dark Buff
G U L F O F M E X I C O
TROPIC OF CANCER
BAHAMA ISLANDS
CUBA
Longitude West from Greenwich
G H J K L M
95° 90° 85° 80° 75°
35 30 25
L.L. POATES ENGR'G CO., N.Y.

is well called a drowned river system. By this is meant that the trunk valley and its branches were submerged by the sea entering their lower parts because of a sinking of the edge or of larger parts of the continent. The historical meaning of these conditions can hardly be reckoned. It is enough here to observe that nearly all the harborages and quiet salt waters of the Atlantic border have this origin, and that thus have grown the great seaboard cities, where ships may ride safely at the mouth of tidal streams whose waters offer gateways to the interior of the continent.

Appalachian Mountains.—From the physical point of view these may be taken as the eastern part of the rocky skeleton of the country and the continent. In their highest points, the White Mountains in the north and the Black Mountains in the middle south, they attain elevations exceeding 6000 feet in the loftiest projections east of the Rocky Mountains. Historically they form the Appalachian barrier, with large consequences in Colonial annals and in the opening of the lands that lie westward. See APPALACHIANS.

Central Lowlands.—The central part of the United States between the Appalachians and the 100th meridian is commercially a unit and a great agricultural section. The plains in this region pass gradually up into the plateau on the east. To the north they merge with the smooth lowlands about the Great Lakes, to the south they are continuous with the Gulf lands, and to the west they pass gradually into the high plains west and south of the Missouri River. The region is roughly coterminous with the prairies. See PRAIRIE.

Great Lake Region.—The lands about the Great Lakes have considerable variety. During the recession of the continental glacier the lakes had higher water levels and often much greater extent than now. During this flooded condition what are now the bordering lands received a cover of such fine muds as are spread upon the bottom of all great bodies of water. To some extent previous inequalities are masked, and the resulting surface is often very smooth and almost level. This is especially true of Lakes Ontario, Erie, Huron, and Michigan. Some of these lands were treeless and hence were properly called prairies, although modern physiography prefers to designate them as lake plains. Lake Superior is surrounded by older rocks, which have been greatly disturbed and metamorphosed, and the remnants of these ancient mountains form a higher and rougher land than about the lower lakes. This is true of the northern peninsula of Michigan, of Wisconsin, and of northeastern Minnesota. Naturally, therefore, these rocks hold vast stores of iron and copper, while the strata of the prairies offer little in the way of mineral resources except coal. See GREAT LAKES.

Gulf Plains.—These are most simply defined as a continuation of the Atlantic coastal plain, or another part of the younger fringe of the continent. In central Georgia and Alabama the younger formations abut on the older rocks of the southern Appalachians and mark approximately the encroachment of the later seas. By gentle uplift the marginal sea bottoms of the Gulf were laid bare and form the flat lowlands of this semitropical region. Before the uplift Florida existed as an extension of the submarine platform which probably extended to Cuba and beyond. Its limestone strata have resulted in cavernous openings in the rocks, underground streams, and springs of great volume. The seaward edge of this land abounds in sand bars, coral reefs, and mangrove swamps, and this single State, counting its main shores, its bays and numberless islands, has more than 4000 miles of shore line.

Westward from Alabama the Mississippi River (q.v.) becomes the controlling feature in the topography of the Gulf region. The broad Gulf plain occupies a large part of southern and eastern Texas. As in the region to the eastward, the younger rocks have been made into land by uplift and retreat of the sea. As a rule the surface slopes gently towards the Gulf, but with escarpments and great local variations of topography. Some areas are prairie, while others are heavily forested, and the rise to the northwest leads first to the great plateau, or Llano Estacado, and then to the mountains of the Rocky Mountain Range. The shore line is a long crescent, bordered by extensive barrier beaches and sand bars, which inclose stretches of quiet water. Galveston is on one of these beaches, and it is thus exposed to the Gulf hurricanes.

Great Plains.—This is the name usually given to the lands which rise gradually from the prairies to the eastern base of the Rocky Mountains. But the altitude of these lands is such that they are often called the high plains. From altitudes of about 1000 feet along the Missouri River in Kansas and Nebraska, they rise to heights of 5000 to 6000 feet at the foot of the western mountains. In general this rise is imperceptibly gradual, but its continuity is sometimes interrupted by escarpments, and the easterly flowing rivers have incised shallow valleys upon the region. The strata are little disturbed, and thus the country resembles the prairie region, but the underlying beds are geologically younger and are overlain in many areas by large bodies of waste, which in part may have been deposited in lakes and in part was no doubt distributed by torrents from the mountains. Climatic causes have also made the region different in aspect from the prairies. The plains have from 10 to 20 inches of rain per year; therefore forests are infrequent, the vegetation consists largely of sparse grasses, and agriculture is altogether dependent on irrigation. Over large areas the water supply for this purpose is deficient and grazing is the only remaining resource. This region is a vast one, having the east and west limits already given and reaching from central Texas to the north border of the country, where it merges into the great western plains of Canada. In the north the most prominent break in the plains is the Black Hills mountain area. Here an elevated mass of ancient rocks protrudes through the younger strata, giving a region of rugged relief, hard rocks, mines, and forests. In the Black Hills region, in much of the western Dakotas, and in Montana and western Nebraska, are the Bad Lands (q.v.).

Uplands of Missouri and Arkansas.—The most extensive body of elevated land between the Appalachians and the higher levels of the great plains lies in southern Missouri and in northern and central Arkansas and westward. In Missouri and northern Arkansas these uplands are of moderate height, dissected by the rivers, covered with forests, and known as the Ozark plateau. Still better known, owing to their metallic deposits, are some low mountains of very ancient rocks, outliers of the Ozarks, familiar as Iron Mountain and Pilot Knob. Running through southern Arkansas are the Ouachita Mountains. These rise from below the young sediments of the Mississippi valley and trend westward, passing through Indian Territory and Oklahoma into northern Texas. This upland region south of the Missouri River, therefore, is associated on various sides with the prairies, the alluvial plains of the Mississippi, the Gulf plains of the South, and the great plains of the West.

Rocky Mountains.—The name is properly applied only to the eastern ranges of the Cordilleras. The ranges with numerous peaks rising above 14,000 feet extend through Idaho, Montana, Wyoming, Colorado, and New Mexico and send some outlying ridges into Texas. See ROCKY MOUNTAINS.

Colorado Plateaus.—West of the Rocky Mountains, in Colorado, Utah, New Mexico, and Arizona, are the Colorado plateaus. The prominent and general characteristics of the plateaus are the flat but partially dissected upper surfaces of the various parts, the distinct boundaries of the individual plateaus as marked by fault scarps, and the great cañons that ramify through almost every section. The most striking feature of the plateaus is the Colorado River with its world-famed cañon. This great stream confines its drainage, save near its mouth, to an upland several thousand feet above the sea. Having abundant sources in the rains and snows of the various parts of the Rocky Mountain Range and rising at great altitudes, it has both velocity and volume and hence has cut deeply into the plateaus. This being an arid region, the abundant waters are of remote derivation and sunk in the cañons, while the sparse rainfall causes desert conditions to be general, with much exposed rock, little vegetation, and a general absence of conditions favorable to civilized life. Closely associated with these great plateaus are two short lofty ranges of mountains. One of these is the Wasatch, marking the boundary between the plateaus and the Great Basin in central Utah. The other is the Uinta Range, about 150 miles in length and extending from northwestern Colorado through the borderlands of Wyoming and Utah. Its chief development is in the latter State, and in its east and west trend it departs from the usual direction of American mountain axes.

Great Basin.—This is an area of interior drainage, made up of many minor basins, of which the chief is that of the Great Salt Lake in Utah. See GREAT BASIN.

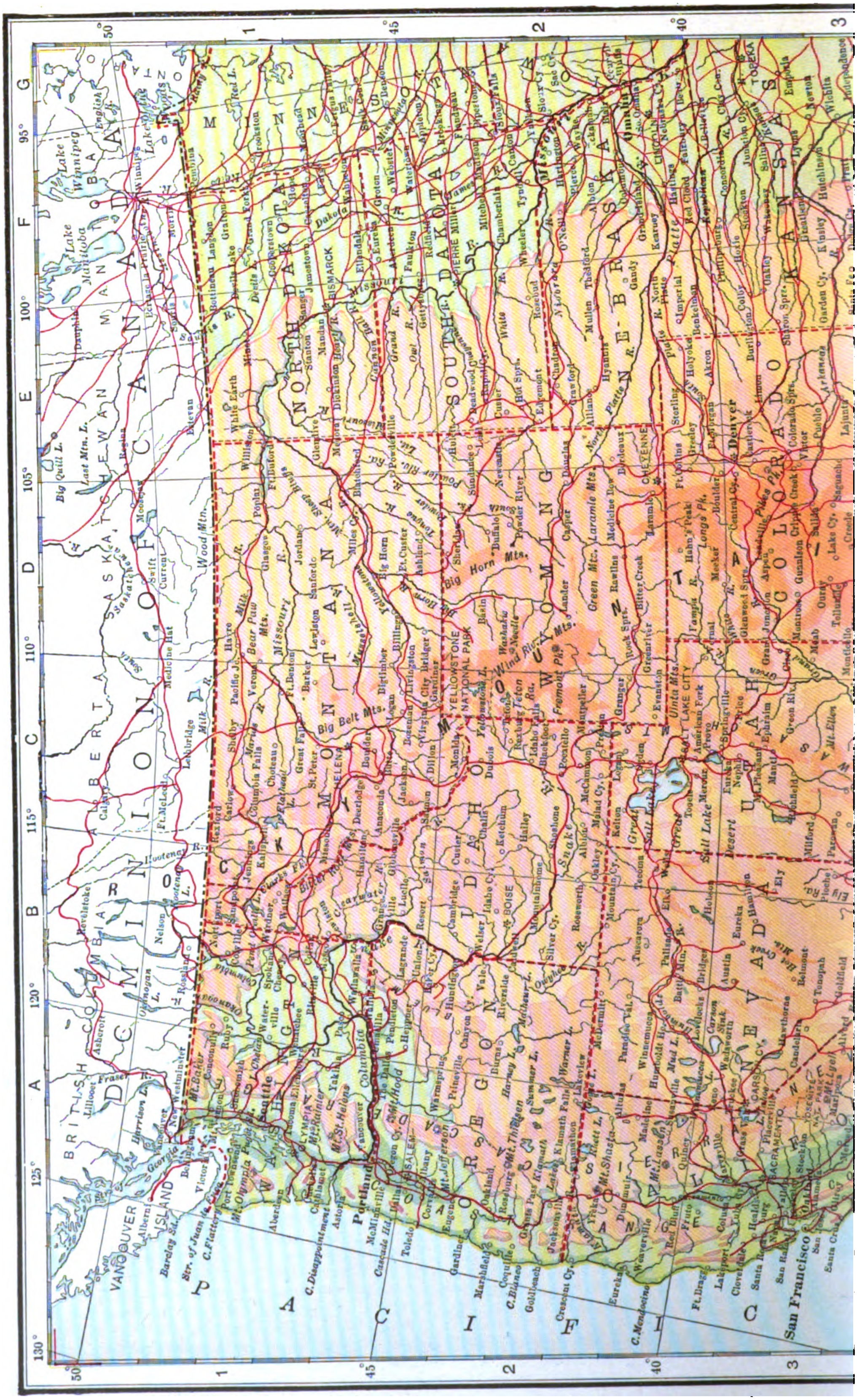
Columbia and Snake River Plateaus.—Large areas drained by these streams in Idaho, Oregon, and Washington are of volcanic origin, and along the Snake River in Idaho and Oregon the lavas form plateaus about 4000 feet in altitude. They are a natural desert, since the region is arid, but are capable of great development under the process of irrigation.

Mountains and Valleys of the Pacific Coast.—The features to which reference is here made belong to three States, California, Oregon, and Washington. They will be best understood if it is observed that a single lofty range, the Sierra Nevada, forms the eastern border of California, and that it extends, under the name of the Cascade Range, northward through central Oregon and Washington. Its loftiest peak, in California, is Mount Whitney (14,502 feet), which is the highest point of the entire United States south of Alaska. Bordering the sea are lower mountains, in the form of a series of ranges known as the Coast Ranges, parts of it being known as the Klamath Mountains in Oregon and the Olympic Mountains in Washington. (See SIERRA NEVADA; CASCADE RANGE; ETC.) Between these parallel ranges are lowland valleys of the utmost importance in the development of the region. They include in California the great valley drained by the Sacramento and San Joaquin rivers, the centre of the fruit and grain culture of the State; in Oregon the Willamette valley; and still farther north the Puget Sound valley in the State of Washington. In these mountain ranges the extinct volcanic cones of Shasta, Hood, Rainier, and Baker are prominent features, and Lassen in active eruption adds a new character. The coast line of the Pacific is not nearly so great as that of the Atlantic coast, because it is less indented. It has, however, a few of the choicest bodies of inland or protected waters to be found on any shore. Such are San Francisco Bay and Puget Sound, while the deep, tidal Columbia and Willamette rivers offer similar advantages to northern Oregon. It is thus seen that the Cordilleran system is made up of many parallel ranges of mountains, separated in turn by intermontane areas of lofty plateaus and valleys, or, nearer the Pacific Ocean, by broad and fertile lowlands.

Hydrography. The drainage of the United States may be classed as Atlantic and Pacific. As with the entire continent and with South America, the smaller ocean receives by far the greater contribution of fresh water from the lands now under review. The Atlantic streams may be considered as belonging to the Hudson Bay, the Gulf, or to open-sea drainage. With unimportant exceptions farther west, the Red River of the North carries a small contribution of the United States area to Hudson Bay. The open-sea streams are all of moderate length and volume except the St. Lawrence, which, rising in Minnesota, expands into lakes of exceptional size. (For details concerning these bodies of water see GREAT LAKES.) All the streams which enter the lakes from the United States are relatively small. Their courses are short, which is equal to saying that the line of water partings between the Laurentian and Mississippi basins is close to the lakes. The divide is also nearly everywhere quite inconspicuous. The streams have thus small capacity for transporting land waste into the lakes. Such waste as reaches the lakes rests in them, a condition from which results the exceeding clearness of Niagara, or of the St. Lawrence waters that pass the Thousand Islands.

The open Atlantic streams, draining that part of the country which is historically oldest, and being often tidal, have a fame and a commercial value out of all proportion to their size. To begin with the rivers of New England, its conspicuous streams—the Penobscot, Kennebec, Merrimac, Connecticut, and Housatonic—are most of them entered by the tides for many miles. The Merrimac and Connecticut, above tide water, are types of many New England rivers which, being interrupted by rapids resulting from the glacial invasion, furnish a great store of water power.

New York is composite in drainage. The Hudson, with the Mohawk, drains much of its central and eastern lands, but is chiefly impor-


DOMINION OF CANADA
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
VANCOUVER ISLAND
PACIFIC OCEAN
WASHINGTON
OREGON
CALIFORNIA
IDAHO
MONTANA
NEVADA
UTAH
WYOMING
COLORADO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
MINNESOTA
IOWA
YELLOWSTONE NATIONAL PARK
Lake Winnipeg
Lake Manitoba
Great Salt Lake
Seattle
Portland
Spokane
Tacoma
Olympia
Salem
Boise
Helena
Bismarck
Pierre
Cheyenne
Denver
Salt Lake City
Sacramento
Carson
San Francisco
Omaha
Topeka
Winnipeg
Regina
Calgary
Victoria
Vancouver
Big Horn Mts.
Big Belt Mts.
Bitter Root Mts.
Uinta Mts.
Wind Riv. Mts.
Laramie Mts.
Mt. Rainier
Mt. Hood
Mt. Shasta
Pikes Pk.
Longs Pk.
Missouri R.
Columbia R.
Snake R.
Platte R.
Yellowstone R.
50°
45°
40°
130°
125°
120°
115°
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100°
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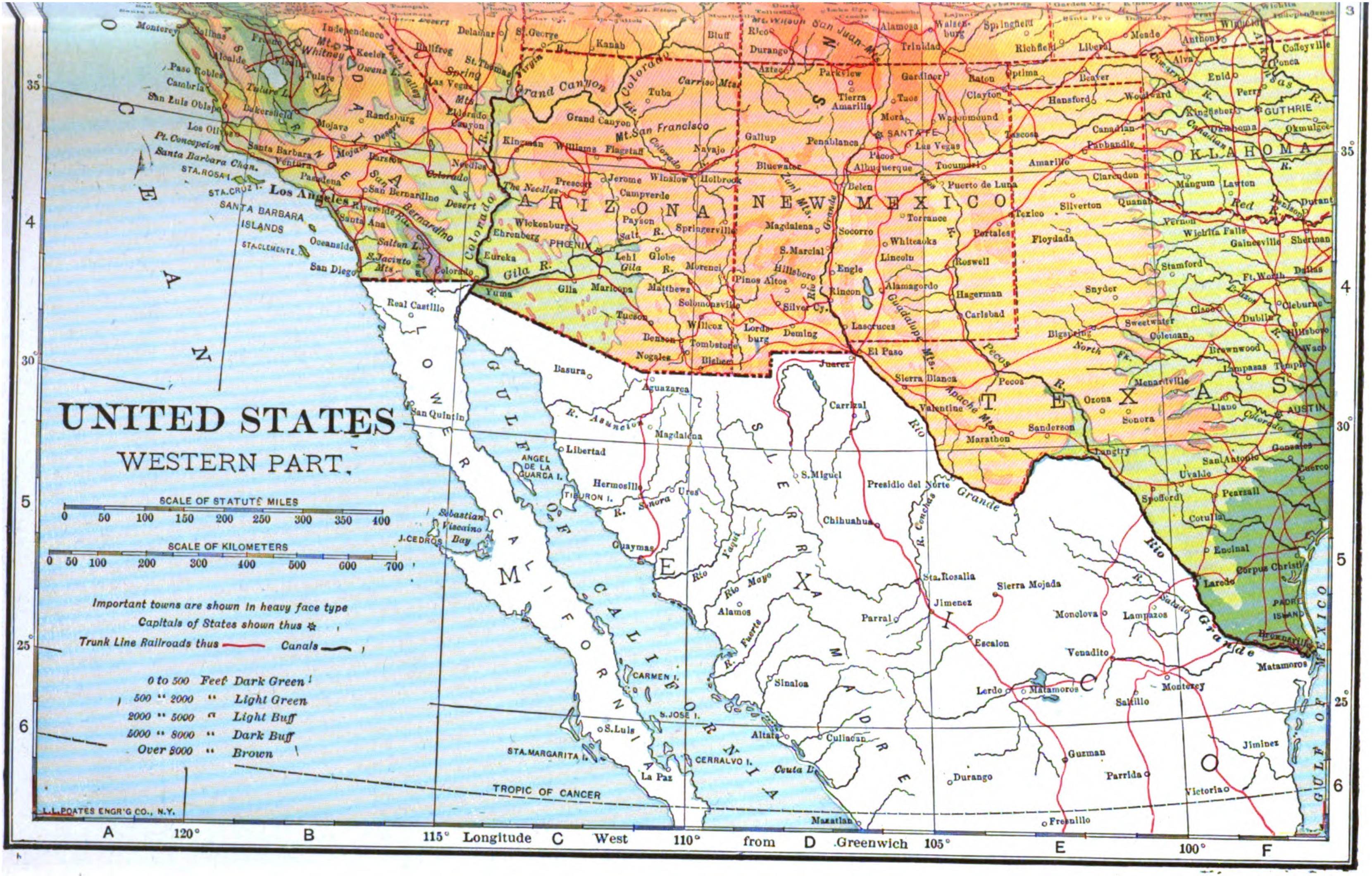
UNITED STATES
WESTERN PART
SCALE OF STATUTE MILES
0 50 100 150 200 250 300 350 400
SCALE OF KILOMETERS
0 50 100 200 300 400 500 600 700
Important towns are shown in heavy face type
Capitals of States shown thus ✫
Trunk Line Railroads thus
Canals
0 to 500 Feet Dark Green
500 " 2000 " Light Green
2000 " 5000 " Light Buff
5000 " 8000 " Dark Buff
Over 8000 " Brown
L.L.POATES ENGR'G CO., N.Y.
A
120°
B
115° Longitude
C
West
110°
from
D
Greenwich
105°
E
100°
F
3
35
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30
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25
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O C E A N
ARIZONA
NEW MEXICO
OKLAHOMA
TEXAS
MEXICO
LOWER CALIFORNIA
GULF OF CALIFORNIA
GULF OF MEXICO
SIERRA MADRE
TROPIC OF CANCER
Los Angeles
San Diego
Santa Barbara
Ventura
Pasadena
San Bernardino
Riverside
Santa Ana
Oceanside
Monterey
Salinas
Fresno
Paso Robles
Cambria
San Luis Obispo
Tulare
Bakersfield
Mojave
Randsburg
Independence
Keeler
Mt. Whitney
Owens L.
Death Valley
Bullfrog
Las Vegas
St. Thomas
St. George
Delamar
Kanab
Bluff
Durango
Aztec
Rico
Mt. Wilson
San Juan Mts.
Alamosa
Walsenburg
Trinidad
Springfield
Richfield
Liberal
Meade
Anthony
Wichita
Coffeyville
Ponca
Alva
Enid
Perry
GUTHRIE
Kingfisher
Oklahoma
Okmulgee
Grand Canyon
Colorado
Tuba
Carriso Mts.
Mt. San Francisco
Flagstaff
Williams
Kingman
Navajo
Holbrook
Winslow
Jerome
Prescott
Campverde
Payson
Springerville
Salt R.
The Needles
Needles
Wickenburg
Ehrenberg
PHOENIX
Eureka
Gila R.
Yuma
Lehi
Globe
Morenci
Maricopa
Matthews
Solomonsville
Tucson
Benson
Tombstone
Bisbee
Nogales
Willcox
Lordsburg
Deming
Silver Cy.
Pinos Altos
Hillsboro
Rincon
Engle
S. Marcial
Magdalena
Socorro
Zuñi Mts.
Gallup
Bluewater
Albuquerque
Belen
Penablanca
Pecos
SANTA FE
Las Vegas
Mora
Taos
Tierra Amarilla
Parkview
Gardiner
Raton
Optima
Clayton
Wagonmound
Tucumcari
Puerto de Luna
Torrance
Whiteoaks
Lincoln
Alamogordo
Las Cruces
El Paso
Portales
Roswell
Hagerman
Carlsbad
Guadalupe Mts.
Texico
Tascosa
Amarillo
Hansford
Beaver
Woodward
Canadian
Panhandle
Clarendon
Silverton
Quanah
Floydada
Mangum
Lawton
Vernon
Wichita Falls
Gainesville
Sherman
Denison
Durant
Red R.
Stamford
Snyder
Ft. Worth
Dallas
Cleburne
Dublin
Hillsboro
Waco
Clyde
Sweetwater
Coleman
Brownwood
Lampasas
Temple
Big Spring
Menardville
Llano
AUSTIN
Gonzales
Cuero
Ozona
Sonora
Pecos
Sierra Blanca
Valentine
Apache Mts.
Marathon
Sanderson
Langtry
San Antonio
Uvalde
Spofford
Pearsall
Cotulla
Encinal
Corpus Christi
Laredo
PADRE ISLAND
Brownsville
Matamoros
Rio Grande
Juarez
Carrizal
Presidio del Norte
Chihuahua
S. Miguel
R. Conchos
Sta. Rosalia
Sierra Mojada
Jimenez
Parral
Escalon
Monclova
Lampazos
Salado R.
Venadito
Monterey
Saltillo
Lerdo
Matamoros
Jiminez
Guzman
Parrida
Victoria
Durango
Fresnillo
Culiacan
Sinaloa
Altata
Mazatlan
Alamos
Rio Mayo
R. Fuerte
Rio Yaqui
Guaymas
Hermosillo
Sonora R.
Ures
Magdalena
Aguazarca
R. Asuncion
Basura
Libertad
TIBURON I.
ANGEL DE LA GUARDA I.
CARMEN I.
S. JOSE I.
CERRALVO I.
La Paz
Couta B.
S. Luis
STA. MARGARITA I.
Sebastian Viscaino Bay
J. CEDROS
San Quintin
Real Castillo
STA. ROSA I.
STA. CRUZ I.
SANTA BARBARA ISLANDS
STA. CLEMENTE I.
Santa Barbara Chan.
Pt. Concepcion
Los Olivos
Salton L.
S. Jacinto Mts.
Colorado Desert

tant for its tidal course of 150 miles, with great harborage at its mouth, and an open gateway to the west from the head of tide water. The Genesee, Black, and other rivers carry to the St. Lawrence much of the run-off of northern and western New York. The Susquehanna, the Delaware, and the Mississippi take nearly all the remainder of New York waters. The Allegheny gathers for the Gulf of Mexico waters that fall within a few miles of Lake Erie.

The Delaware, Susquehanna, and Potomac are all important rivers which rise in the Appalachian plateau and find their way across the various mountain ridges of the Appalachian system by water gaps, and enter the seas through drowned valleys which are characteristic of all the Atlantic streams north of Virginia. In the plateau, where the strata are nearly horizontal, the streams are dendritic, or finger-like, in arrangement. Within the mountain belt the streams are in part longitudinal and in part transverse. By thus running between the ridges and cutting through them in water gaps a rectangular or trellised drainage is formed which is widely found in the Appalachian region. The northern Appalachian waters thus flow mainly to the open Atlantic. In the south, however, or beyond the Potomac, the coastal rivers head in the eastern edge of the mountains, while the Kanawha and the Tennessee, with their branches, head far across the mountains and carry the waters to the Ohio River. The great core of the southern Appalachians in western North Carolina, so convenient it would seem to the sea, is thus drained by a circuitous route into the Gulf of Mexico. The entire belt of Appalachian uplands has for the most part arrived at the stage of mature dissection, with abundant valleys, sunk from 500 to 1500 feet below the prevailing level of the uplands.

Many rivers of local importance rise on the east slope of the Blue Ridge and cross the piedmont plateau and the coastal plain to the sea. Such are the James and other rivers of Virginia, the Roanoke, Cape Fear, Great Pedee, Savannah, and Altamaha of the Carolinas and Georgia. The rivers of Florida are mainly small, but have important tidal courses. The other Gulf drainage is overshadowed in magnitude by the Mississippi. The greater streams aside from this are the Chattahoochee, Alabama, and Tombigbee on the east, and the Colorado (of Texas) and Brazos on the west, and the international Rio Grande, rising in Colorado.

Mississippi River.—See MISSISSIPPI RIVER.

Pacific Drainage.—The Rocky Mountains, especially in Colorado and northward, are the sources of many streams, part of which empty into the Pacific. To the south they send forth the Rio Grande. To the east flows the Arkansas, while to the north and east pass important branches of the Missouri. From the southwest issues the San Juan, while farther north the Grand, White, and Yampa rivers rise in Colorado. All of these join the Colorado River (q.v.) and thus introduce us to the most southerly of rivers in the United States that reach the Pacific Ocean by way of the Gulf of California. Some of the chief facts concerning this river have been given in the description of the topography of the region. Its ultimate sources are in the Wind River Mountains of Wyoming. The only remaining master stream is the Columbia, with its widespread sources in the Rocky Mountains. These largely belong to its tributary, the Snake River, which after passing the lava plateaus joins the trunk stream in south Washington. The Columbia has an important tidal course before it enters the ocean, and this and the St. Lawrence are the only rivers of the United States which receive great accessions to their waters from foreign territory.

The Hudson may be taken as the type of that great number of streams, especially on the Atlantic side, which have a tidal course. Within the glaciated district most rivers show serious inequalities in their beds, causing innumerable rapids and waterfalls. Such concentration of descent does not occur elsewhere, save in the mountainous belts. The greatness and destructiveness of floods depend upon rainfall, gradient, the porosity of the rocks or soil, and other features. Thus the Ohio has steep slopes, an impervious bed, and a moist climate, when compared with the Missouri taken as a whole. In its long course across the plains the latter loses by seepage, by evaporation, and by abstraction of water for irrigation.

The rivers exhibit great diversity in relation to human uses. The Merrimac and many other streams within the glacial belt are mainly useful for manufacturing or for water supply. The Mississippi is chiefly of value theoretically, but actually its importance is decreasing as a highway, while the Hudson combines transportation, water and ice supply, and the furnishing of power. The Colorado is thus far almost purely scenic in its relation to man, arousing interest by the origin and magnificence of its cañons. The streams of the West are largely used for irrigation. See IRRIGATION.

Climate. The greater part of the area of the United States proper has a climate pertaining to the temperate zone. The average annual temperatures vary from somewhat less than 40° on the northern border to 75° in the extreme southeast. The average temperature for July is about 65° on the north border, and for January it is about 20°. The whole country is exposed to much greater annual oscillations of temperature than occur in Europe. The extreme maximum temperatures are as high as 115° to 120° in the drier portions of Texas and Arizona, and the average minimum falls as low as —60° in northern Montana. The climate of the United States is controlled very largely by its characteristic winds and by its topography. In general the prevailing winds are from the west, coming to the west coast off the Pacific Ocean. To that coast they bring the moisture and uniform temperature of the sea. If the land is cooler than the sea, as in winter, they bring copious rains. If the land is warmer, as in summer, they bring little or no rain, and the moist-air currents pass on eastward to water the Rocky Mountain region. Hence the winter is the rainy season on the Pacific coast and the summer is the rainy season in the Rocky Mountain region.

The majority of the storms originating in the northwest or over the northern Pacific Ocean, travel at first southeastward to the Mississippi valley and then with an east-northeastward course pass over New England or down the St. Lawrence valley. The winds of these cyclones blow spirally inward towards the storm's centre; thus, over the greater part of the country, the winds in advance of such storms are from the east-southeast and south, and draw warm, moist air from the Atlantic and the Gulf of Mexico. After the passage of the storm centre the winds shift to the west and northwest and are cold, coming from the north interior of the continent. Occasionally more violently whirling storms come up from the West Indies, the tropics, and invade the east United States. These are commonly more intense and severe, but affect smaller areas than those of the westerly winds and resemble closely the typhoons of the Philippines. The absolute annual range of temperature is, of course, greatest in the interior of the country, being about 150° in the upper portion of the Missouri valley and diminishing to 60° in the southern part of Florida and the northwestern part of Oregon. The suddenness with which the air temperature falls is an important consideration. Thus changes of 20° in 24 hours occur far more frequently in the lake region than in the Ohio valley and there again oftener than of the south coast.

The average date of killing frosts in the spring and autumn determines the average length of the growing season for most of the important crops. The autumnal date is September 15 for the region from North Dakota to Lake Huron and October 15 for the region from Colorado to Pennsylvania and northeastward along the New England coast. The latest spring frosts occur on May 20 from Idaho to Lake Superior and February 15 along the South Atlantic and East Gulf coasts. The growing season may be considered as the interval between the last frost of spring and the first of autumn, or it may also be defined as the season within which the average daily temperature does not fall below 40°. From this point of view the growing season diminishes as one goes northward and amounts to about 120 days at the north border of the United States. By a natural process of selection, stimulated by culture, plants that formerly required this length of time for maturity are now pushing northward beyond the borders into Canadian regions where the growing period is as much as 20 days shorter.

One of the most notable features in the climate of the United States is the great contrast between the Atlantic and Pacific coasts. This is due to the fact that the prevailing winds are from the west and northwest. The land is heated quickly and as quickly cools. The sea is heated slowly, and as the water has circulation it tends to obtain a uniform temperature. Hence the west winds blowing off the Pacific give the west coast a mild and uniform climate. The winds coming from the interior of the continent to the east coast give it a hot climate in summer and a cold climate in winter. The contrast between the mean temperatures on the immediate coast of the United States in January and July are shown in the accompanying table. The temperatures here given are as read off on charts of isotherms and refer to locations on the land at sea level near the shore. These temperatures are controlled largely by the prevailing winds and the adjacent oceans. A similar great contrast prevails between the temperatures on the east side of Asia and west side of Europe; but in the Southern Hemisphere the corresponding contrasts are not so marked, owing to the presence of the great Southern Ocean and the small area and low altitude of the lands.

LATITUDE NORTH	January			July		
	Atlantic coast	Pacific coast	A—P	Atlantic coast	Pacific coast	A—P
48°...	14°F.	39°F.	−25°F.	63°F.	55°F.	+ 8°F.
46....	18	39	−21	63	60	+ 3
44....	20	40	−20	65	65	+ 0
42....	30	44	−14	70	65	+ 5
40....	32	45	−13	73	60	+13
38....	40	49	− 9	75	65	+10
36....	45	50	− 5	77	65	+12
34....	47	50	− 3	80	65	+15
32....	50	50	− 0	82	70	+12

Another striking peculiarity in the climate of the United States is the great contrasts of dryness and rainfall. The heaviest precipitation (100 inches and over) and humidity prevail on the coast of Oregon and Washington, due, as noted above, to the prevailing westerly winds and, since nearly all of it comes in the winter, to the fact that the land is then colder than the sea. This winter rainfall diminishes southward, and in southern California it is slight. In the Great Basin and the Rocky Mountain region the rainfall is slight (5 to 20 inches), and the country is in greater or less degree a desert. Yuma in Arizona, Sante Fe in New Mexico, and Pueblo in Colorado have mean relative humidities of 43, 45, and 46 per cent respectively. The amount of evaporation from the soil is correspondingly large in these regions, and artificial irrigation is quite essential for successful agriculture. Even the summits of the mountains of this portion of the continent show but little permanent snow, and that in sheltered spots. What would remain on the ground in an ordinary moist climate is rapidly evaporated in this dry air. Here the scanty rainfall comes mainly in the summer, being, as noted above, derived from the Pacific.

The eastern parts of the country derive their rain from the Gulf of Mexico and the Atlantic Ocean, the former supplying most of the Mississippi valley and the latter the Atlantic plain. The heaviest rainfall in this part of the country is on the north shore of the Gulf of Mexico, where the saturated warm south winds reach the land. Here the annual rainfall exceeds 60 inches. Thence northward up the Mississippi valley the amount diminishes, until about the Great Lakes the precipitation does not exceed 30 to 35 inches. Westward also it becomes lighter, until at the east base of the Rocky Mountains it is in the neighborhood of 15 inches. On the Atlantic coast it is abundant, being supplied from the Atlantic by easterly winds. At Cape Hatteras it is 60 inches, diminishing northward along the coast to 45 inches and diminishing also inland.

Thus the three sources of water supply to the country are the Pacific, which supplies the entire Cordillera region; the Gulf of Mexico, which supplies the Mississippi valley and the region of the Great Lakes; and the Atlantic, which supplies the Atlantic plain. The areas supplied by these three sources are, roughly estimated in percentages of the total area: Pacific, 45 per cent; Gulf of Mexico, 44 per cent; and Atlantic, 11 per cent. The proportions of the total rainfall which are contributed by these three bodies of water are quite different, being roughly as follows: Pacific, 29 per cent; Gulf, 56 per cent; and Atlantic, 15 per cent.

Vegetation and Flora. The eastern and western portions of the United States differ greatly in their vegetation. A small area on mountain summits in northern New England and New York is too cold for trees and has herbs and low shrubs of arctic aspect. A large part of the eastern United States north of lat. 44°, with isolated patches on the mountains farther south, where the annual snowfall exceeds 50 inches, is characterized by dense forests of spindle-shaped conifers, such as spruce, fir, tamarack, arbor-vitæ, and jack pine, very similar in aspect to the forests of the colder parts of Europe and Asia, interspersed with many peat bogs or muskegs in depressions and hardwood forests on the richer soils. In these forests there are no broad-leaved evergreen trees, but many evergreen shrubs, largely of the heath family. Berry-bearing plants are abundant, and sedges are more numerous than grasses. All such coniferous forests are subject to fire, once or twice in a long period of years, killing the trees, which are then temporarily replaced by birch, aspen, and other short-lived hardwoods, together with various shrubs and coarse herbs characteristic of such situations, known collectively as fireweeds.

A little farther south, and at lower altitudes on the mountains, usually in better soil, are forests of white pine, hemlock, and numerous hardwoods characteristic of cool-temperate regions.

Most of the country between southern New England and central Mississippi, as far inland as the Alleghany plateau and coastward to the edge of the coastal plain or a little way into it, including the lower slopes of the Appalachian Mountains, has pines and deciduous hardwoods in varying proportions, with a great variety of species in different parts. Something like half the forest in this area is now replaced by fields and pastures. The forests of the Ozark region of Missouri and Arkansas are similar, but with fewer species.

From western New York and central Minnesota to Indiana and Tennessee was originally the great hardwood region of the continent, with over 90 per cent of the trees deciduous. Handsome spring flowers are very noticeable in the forests, which now cover only a small part of the region, the rest, on account of the very fertile soil, being given over to agriculture.

A belt averaging about 100 miles wide from the mouth of the Ohio River to the Gulf is the Mississippi embayment of the coastal plain, mostly alluvial bottoms, originally densely wooded (except near the coast) with cypress, sweet gum, cottonwood, sycamore, elm, pecan, several oaks, and other deciduous trees, with comparatively few shrubs and herbs.

In the sandy coastal plain from Cape Cod to southeast Louisiana, pines of several species constitute the bulk of the forests. These pine barrens are interspersed with numerous swamps, shallow ponds, bays, pocosins, hammocks, scrubs, marshes, and prairies. There are more evergreen hardwoods or broad-leaved evergreens in the coastal plain than in any region previously mentioned. The pine forests have been reduced about one-third by lumbering and farming. Fire sweeps through the grassy undergrowth nearly every winter, but does little damage to the trees.

An area of a few hundred square miles near the coast in extreme eastern and southern Florida, where frost is practically unknown, is characterized by dense tropical jungles of broad-leaved evergreens, of many species, mostly with crooked trunks and fleshy fruits. In such forests fires are rare, but very destructive. A few tropical trees are found also in extreme southern Texas.

A narrow strip of salt marsh and dune vegetation is nearly continuous along the Atlantic and Gulf coasts from Maine to Texas, except in south Florida, where there are mangrove swamps instead of marshes and almost no dunes.

The great American prairie region extends from west Indiana to North Dakota and Texas. Trees (nearly all of them deciduous) are chiefly confined to the immediate vicinity of streams, and the predominant vegetation is grasses and other coarse herbs, which make a great display of flowers in late summer. Prairie fires were the terror of the early settlers, but are no longer dreaded, for the area is now nearly all in cultivation.

The Great Plains are higher and drier, with more diversified topography and soil and less luxuriant vegetation. The Rocky Mountains (q.v.), extending from Canada to New Mexico, with a little interruption in Wyoming, have considerable areas above timber line. The slopes bear a rather sparse growth of spindle-shaped conifers of several species, varying with altitude, similar in aspect to those of the Northeastern States. Deciduous trees are chiefly confined to banks of streams and recently burned areas. There are many natural meadows and parks, with diversified herbaceous vegetation.

The Colorado plateau, southwest of the Rocky Mountains, is mostly dotted with sagebrush, greasewood, shad scale, and other low hoary shrubs, giving the vegetation a gray tone. But there are vast open forests of yellow pine (*Pinus ponderosa scopulorum*), somewhat resembling the southeastern pine barrens, near its southern edge in Arizona, and scattered junipers and nut pines or piñons (*Pinus edulis*) on rocky slopes.

The hot deserts from western Texas to southeastern California are characterized by scrubby spiny plants with reduced or thickened foliage, such as cacti of many species, yucca, sotol, lecheguilla, ocotillo, palo verde, mesquite, acacia, and creosote bush. In some places, especially at higher altitudes, there is enough grass to support large herds of cattle, but elsewhere grass is scarce. Willows and cottonwoods are common along some of the streams. Some of the mountains in the desert region are high enough to be rather cool and moist and support forests much like those of the Rocky Mountains.

The Great Basin, which covers nearly all of Nevada and parts of the adjoining States, is similar in topography to the hot deserts just described, and equally arid, but cacti and other spiny and fleshy plants are rare, and sagebrush and other gray bushes make up the bulk of the vegetation. Junipers and piñons occur on mountain slopes, as in the Colorado plateau. There are some vast plains of salt and alkali nearly devoid of vegetation, such as the salt desert of western Utah and Death Valley in California.

The arid Columbia plateau and Snake River lava desert are mostly treeless, with sagebrush and greasewood at lower altitudes (below 1500 feet), bunch-grass prairie higher up, a few willows and cottonwoods along streams, and yellow pines on mountain slopes.

The Cascade and Sierra Nevada Range, extending from Washington to southern California, with the heaviest snowfall in the United States, is treeless at higher altitudes, but mostly covered with magnificent coniferous forests, interspersed with meadows or natural parks, somewhat like those of the Rocky Mountains. Northward the forests consist mostly of Douglas spruce, lodgepole pine, western hemlock, various species of fir, etc., similar in aspect to the northeastern conifers but larger. Southward and eastward and at lower altitudes and on granitic soils the forests are more open, with yellow pine, sugar pine, and incense cedar the prevailing trees, and fires are more frequent and less destructive, being chiefly ground fires. The noted Big Tree (*Sequoia gigantea*) is confined to a few groves on the west slope of the Sierras in California.

The Coast Range, which borders the Pacific coast of the United States with slight interruptions, naturally has a varied vegetation on account of the great range of annual precipitation, from over 100 inches in west Washington to less than 10 inches in south California. Northward dense coniferous forests similar to those of the Cascade Range prevail. The characteristic tree of this region in California, from the north boundary of the State to about 100 miles south of the Golden Gate, is the redwood (*Sequoia sempervirens*). Several other conifers are endemic to the same region, some of them restricted to only a few square miles. There are more broad-leaved evergreens here than anywhere else in the West, characteristic species being the madrona (*Arbutus menziesii*), California laurel (*Umbellularia*), tanbark oak (*Pasania densiflora*), and California live oak or encina (*Quercus agrifolia*). Southward with increasing aridity the forests give way to chaparral (q.v.), a characteristic vegetation composed of stiff evergreen shrubs, and to grass lands.

For additional details, see the articles on the several States; also Adirondacks, America, Black Hills, Everglades, Great American Desert, Okefinokee Swamp, Rocky Mountains, White Mountains, Chaparral, Desert, Forest, Hammock, Pocosin, Prairie, Swamp, etc.

Fauna. The fauna of the United States is an integral part of that of the Nearctic Province (q.v.) and is fully representative of that of North America described in the paragraph *Fauna* under America. (See also Distribution of Animals; *Fauna* under Rocky Mountains.) With the exception of a few strictly boreal species, such as the muskox (q.v.), almost all the genera and species of North American animals of every kind are represented within the boundaries of the United States and its adjacent waters; and most of the Arctic absentees are found in Alaska (q.v.). Reference to the articles cited above and to such articles as Bear, Beaver, Bison, Dinosauria, Eagle, Extinct Animals, Fossil, Fur-Bearing Animals, Grouse, Horse, Oyster, Pronghorn, Puma, Quail, Rattlesnake, Salmon, Skunk, Turkey, Whale, Whitefish, and others, will give a conspectus of the fauna of the country.

Geology. North America, like other continents, combines very ancient areas with those that are geologically young. The primitive framework of the continent was drawn somewhat upon the lines of the existing mountain systems of the east and west, forecasting the Appalachian and Cordilleran uplands and the Mississippi lowlands of to-day. The oldest rock systems belong to pre-Cambrian times and are represented to the northward by an irregular V-shaped area inclosing Hudson Bay between its arms and resting its blunted apex upon the north border of the Great Lakes. Extensions of this early nucleus are found along the Appalachians to Alabama, and consist of hard crystalline rocks of igneous and metamorphic origin, granites, gneisses, schists, marbles, and quartzites being among the common kinds. Such areas are the Adirondacks, some tracts in New England, the Highlands of the lower Hudson and of New Jersey, South Mountain in Pennsylvania, with the Blue Ridge and Unakas of the Southern States. Other primitive masses are found in Wisconsin and Minnesota and form a straggling archipelago in the West, as in the core of the Black Hills, along the axis of the present Rocky Mountain Range, and in the Wasatch and Sierran regions. It must not be thought, however, that the present boundaries of these belts of ancient rock mark the shores of the ancient islands, but the lands now belonging to the United States began thus in narrow strips and patches, east and west.

The next younger but still very old formations belong to the Paleozoic era. This interval of geological time was very long and includes an extended succession of periods, with their subdivisions or epochs. The rocks of the Cambrian, or earliest of these periods, are mainly sandstones, conglomerates, and shales, and are found in limited outcrops about the borders of the earlier crystalline rocks. The Ordovician, Silurian, Devonian, and Carboniferous formations, on the other hand, cover wide areas, especially in the eastern United States. They constitute the bed rocks of a region extending from the Archean axis of the Appalachians, beyond the Mississippi River, reaching into eastern Nebraska, central Kansas, and far into Texas. From the Great Lake region they are found southward to middle Georgia and Alabama, but do not appear along the Mississippi south of the Ohio River. Thus at the close of the Paleozoic era the territory of the United States was a semicontinent on the east, sending lobate areas southward, with the Mississippi embayment between them. There were also rock accumulation and land growth in the Cordilleran region, but it still held a group of islands rather than a continental area. The largest western lands of Paleozoic age are in the region of the Great Basin, but the regions of the Colorado plateaus and of the coastal Pacific States were still sea, the Rocky Mountain belt was a chain of islands, and an unhindered sea swept from the tropical waters to the Arctic.

The Paleozoic era closed, in North America, with what is known as the Appalachian revolution, i.e., with the disturbances which created the great series of folds which now extend from eastern New York to central Alabama. There had long been mountains in the east, as the Adirondacks and Blue Ridge. What their height may have been is not known. During Paleozoic time also the Green and Berkshire ranges of New England were formed. But there were then no mountains west of the Blue Ridge. During all the periods of the Paleozoic era the waste of the older lands on the east and north was swept into an interior sea that ranged from central New York far to the west and southwest. Thus originated the sandstones, shales, and limestones of the Cambrian and succeeding periods, to which reference has been made. Along the old Appalachian border these formations acquired a thickness of several miles. In the mountain building which ensued, these thick beds were crumpled and built into a range of high mountains. These mountains, having wasted away during the long periods which have since elapsed, leave to the

United States the low ranges found now in Pennsylvania, and west of the Blue Ridge in Virginia and more southern States. With the building of the mountains there was a general uplift in the east, which banished the sea waters from the eastern and central States of the Mississippi basin, except in the south.

During the Mesozoic era and the succeeding Tertiary period, the additions to the land areas of the east were confined to the Atlantic border and the Gulf region. From the enlarged lands of the east, following the Appalachian uplift, materials were available for further extensions. In the west the growth was interior as well as on the border, and these later times are marked by the filling in of partially inclosed seas and by retreat of waters, due to massive continental uplift. Thus gradually the western interior sea of the Great Plains region disappeared (as did that of the Colorado basin), and the Pacific shore line was pushed to its present position.

Some of the important episodes of Mesozoic and Tertiary continental evolution may now be noted. The eastern border region has a series of areas of red and brown shale and sandstone, of Triassic age. These formations underlie the lowlands of the Connecticut valley in Massachusetts and Connecticut. Another belt extends from the Palisades of the Hudson into Virginia, and there are other and smaller areas. Associated with these rocks are the lava sheets which form the Orange Mountains of New Jersey, the Palisades of the Hudson, and the Mount Holyoke Range of Massachusetts. The Cretaceous and Tertiary beds of the Atlantic border form southern New Jersey, and the outside lowlands of all the States southward to Florida, and make the coastal plain of this region. They slant gently down and become continuous with the beds that lie below the marginal waters of the Atlantic. Owing to their comparative recency, they are often partially or wholly unconsolidated and occur as sands, gravels, clays, and marls. But they may consist also of well-indurated sandstones and limestones.

Similar statements may be made concerning the formations and the lands that border the Gulf. Here belongs the entire State of Florida, which is low not because of denudation, but because of gentle and limited uplift of the undisturbed and youthful strata which lie beneath its surface. As has been intimated, the ancient Mississippi discharged, not far from the present mouth of the Ohio, into a gulf that thus lay between south-reaching lands on the east and west. Its successive burdens of land waste served gradually to fill the embayment, and its delta reached more and more to the south, encroaching, as it is still, upon the Gulf.

Mesozoic deposits of Triassic, Jurassic, and Cretaceous age are found along the eastern base of the Rocky Mountains, where they are upturned at various angles, as in the vertical or highly inclined strata of the Garden of the Gods. Eastward, at a little remove from the mountains, these beds, which have yielded perhaps the most remarkable series of fossil vertebrate remains that have been obtained in any country, become horizontal and are often covered with still younger stratified formations, which all together make the underlying masses of the Great Plains. The breaking and upturning of the strata seen in the Rocky Mountain foothills points to the main uplift of these mountains which took place at the close of the Mesozoic era.

After the Rocky Mountain revolution, the Great Plains area ceased to be a region of salt-water deposition and was characterized by swamps and great lakes of brackish or fresh water. The Laramie formation belongs to this era of low-lying lands in that region when the sea was excluded, and some of the largest coal deposits of the West were accumulated in the marshes of the time.

Over many thousands of square miles in Colorado, Kansas, Wyoming, and Nebraska are sheets of incoherent or partly consolidated gravels, sands, and clays, which have usually been attributed to sedimentation in such lakes. It is probable, however, that in part, at least, these beds are due to torrents carrying down enormous volumes of waste from the mountains and distributing it in their wanderings over the plains. Present conditions were not approached in this region until the late Tertiary. By that time the entire belt, including the plains and Rocky Mountains, had received a massive uplift, by which the lakes were drained and the plains given an eastward slant, from altitudes of 5000 to 6000 feet at the base of the mountains, to the low prairies west of the Mississippi River.

The rocks of the Colorado plateaus consist of some thousands of feet of sedimentary beds of Mesozoic and younger rocks, overlying a Paleozoic and Pre-Cambrian foundation. The Colorado River has for some distance sunk its channel through the Paleozoic strata and cut far down into the basal granites. Like the Great Plains, this was long a region of marine deposition; here, too, great and widespread uplifts took place, in which the strains were so great as to produce profound fractures and dislocations or faults and attended at times by large outflows of lava. These upflows sometimes stopped below the surface and domed up the overlying strata, making a kind of mountain known as laccolithic, of which the Henry Mountains in Utah are the type.

The initial uplifts of the Sierran mountain belt were made in Mesozoic time, and the strata involved were formed from the waste of the older lands in the present Great Basin region to the eastward. But it was not until late Tertiary time that the entire block or mass of the Sierras was lifted to a great height and tilted to the west. In connection with this uplift a lofty fault scarp developed, which now forms the steep eastern front of the mountains. This crest, therefore, is towards the east, and the principal drainage is down the gentler western slope into the valley of California. The Sierras continue northward as the Cascade Mountains of Oregon and Washington. The Willamette valley in Oregon and the Puget Sound valley in Washington are the analogues of the valley of California, and they are separated from the ocean by a young range of mountains, known as the Coast Range and in parts as the Klamath Mountains and the Olympic Mountains.

Thus it appears that the western United States has had a composite history. It began with island nuclei which grew by sedimentation and uplift. The several great ranges of mountains mark several periods of folding, faulting, and uplift, while both mountains and plains rose by massive and wide-ranging or continental movements, thus adding to the height of the mountains and making the plains into plateaus of from 3000 to 8000 feet in altitude. With these disturbances, especially in Tertiary times, were the most extensive outflows of lava of which this continent shows any record. These are found either as remnant sheets and volcanic necks, or as vast sheets scarcely changed since their outflow. They occur in nearly every Cordilleran State, as on both sides of the Rocky Mountains in Colorado, in New Mexico, in Utah, in Mount Shasta, and the great cones of the Cascades, and especially in the lava plateaus of the Snake and Columbia rivers in Idaho, Washington, and Oregon. As a lingering episode of their interior volcanic energy we may, perhaps, recognize the geyser phenomena of the Yellowstone Park.

Through all the periods which have been passed in review, the process of land sculpture was active and all varieties of relief have been shown, even in the same area, in successive cycles of denudation and uplift. Thus New England is everywhere mountainous in structure, although much of its surface is now reduced to hills, and to valleys whose bottoms are not far above base level.

The strata of the Mississippi basin have for the most part never been raised to considerable heights, and the streams have not had sufficient vigor to be the instruments of largest denudation. But among the mountains and plateaus of the Cordilleran region the land forms owe their reliefs to long-continued denudation, conditioned by the composition and structure of the rocks.

The principal reliefs were given to the country prior to the glacial invasion. But within the field of glacial movement important changes were effected, and in some cases the combined effect of the wearing of hill and mountain tops and of the filling of valleys was to diminish the total relief by several hundred feet. The territory affected includes all of New England, the Middle States into northern New Jersey and Pennsylvania, and the Central States to lines not far from the Ohio and Missouri rivers. Eastern Nebraska was included, with much of the Dakotas, Montana, and the more northern Cordilleras. Small remnant glaciers are still found in the high Sierras, on the volcanic cones of the Cascades, and in Montana and Colorado. The general effects of the ice sheet were the grinding and transport of rocky waste, coarse and fine, the commingling of this material with the preëxistent soils, the formation of moraines and other bodies of drift during retreat, the blockading of ancient valleys causing innumerable changes of drainage, and the formation of thousands of lakes.

Since the departure of the ice, or during postglacial time, many of the smaller or more shallow lakes have been filled by sediment, or by deposits of vegetable origin, sometimes forming beds of peat. In the larger lakes deltas and marshy areas have been formed in the same manner. The interrupted streams have resumed their flow along the lowest line of levels that they could find, and in so doing have often cut through the veneer of drift and worn deeply into the underlying rock. This is the origin of most of the gorges of the Northern States. They are young postglacial valleys, and the old, buried channels are often to be found not far away. These conditions have not only produced striking scenic results, in the gorges and waterfalls of the Northern States, but have created nearly all the available water power of the same region. Before the ice invasion many streams flowed at lower levels, in the deep and mature valleys of the time. But the obstruction of these valleys has compelled the streams to flow at greater altitudes, and the rocky masses and spurs encountered in their downcutting have caused a concentration of descent in rapids or falls and thus have made the streams a source of power, while at the same time obstructing the otherwise open ways of commerce.

Soils. Broadly considered, the soils may be divided into two classes, differing from each other in manner or origin. One class includes the sedentary soils, formed in place, of which the larger proportion have resulted from the decay of the rocks underlying them; their nature depends primarily upon the character of the rocks, whether sandstone, limestone, granite, etc., but is also influenced by the climate and the length of time the soil has been exposed to the weather. Compared with the rocks from which they have been derived the soils of this class contain larger proportions of the more insoluble minerals, like quartz, and less of the soluble ingredients, like calcium carbonate. The soils that have originated in this way occur over a large section outside of the glaciated district. They are the prevalent soils of the South. The second class consists of the transported soils and includes those of glacial, æolian, and alluvial derivation. The glacial soils are found in the northern tier of States that were covered by the Pleistocene ice sheet. Where unmodified they consist largely of heavy clay, but they have often been worked over by water and then are likely to be sandy or loamy in character. Æolian soils are restricted to parts of the Middle West; they consist of exceedingly fine sands with more or less lime and clay as binder and are very deep and fertile. Alluvial soils occur in many of the stream valleys, particularly those subject to periodic inundations, and are best illustrated by the fine silty black soils of the Lower Mississippi basin; they are perhaps the most fertile of all, but for the best results usually have to be drained. See articles on the individual States for further details.

Fisheries. Marine fisheries are practically limited to the submerged coastal plain fringing the continent. The principal fishing grounds of the United States are the Grand Banks of Newfoundland, the Georges Banks off Cape Cod, the Great Bahama Bank off Florida, and the Campeche Bank off Yucatan. The northern waters are remarkable for the enormous quantities of a few species, while the southern are characterized by smaller numbers of individuals, but greater variety of species. Ordinarily the fishing industry concentrates at the nearest point to each of these fishing banks offering a primary market. The total first value is approximately $70,000,000 annually; capital invested, $80,000,000; persons employed, 200,000. Boston—next to Grimsby, England, the largest fresh fish market in the world—distributes chiefly herring, haddock, cod, pollock, mackerel, halibut, swordfish, and lobsters. The fisheries were the basis of the early wealth of New England. Approximately 175,000,000 pounds of fish are annually handled; of these 75 per cent comes from the coast of Massachusetts. Savannah and Pensacola are centres of distribution for the southern fisheries (red snapper, bluefish, bass, pompano). Of the Gulf States Florida leads in variety, volume, and value. Here also sponge fishery is important. On the Pacific coast Seattle, San Francisco, and Portland are the great markets for salmon (value, in 1915, $28,000,000), and halibut (1915 catch, 60,000,000 pounds; value, $3,000,000). In 1914 the Puget Sound fleet consisted of 97 vessels, averaging about 38 net tons per vessel and operating an average of four to five dories per vessel.

Of the anadromous fish, alewives, shad, and striped bass were originally especially abundant on the Atlantic coast, while the salmon and sturgeon were abundant in both Atlantic and Pacific rivers. Unwise methods of fishing have already resulted in commercial extinction of the salmon on the Atlantic coast, and sturgeon, striped bass, shad, and alewife are decreasing. To a large extent the original beds of oysters and other edible mollusks have been extirpated in the Northern sections nearest the primary markets, but in the Southern waters extensive natural beds still obtain. Artificial propagation produces mollusks of better quality and cheaper. At present more than one-half of the market supply of oysters comes from cultivated areas. The annual mollusk crop ranks first in food and in market values (among the United States fisheries) and exceeds that of all other nations combined. The chief centres of the oyster industry are Baltimore, Norfolk, Providence, New Haven, and New Orleans.

The most important manufactured fisheries products in addition to the food specialties of Gloucester are oil and fish scrap from menhaden, oil from the blackfish and dolphin, glue and fish scrap from the wastes.

The great inland rivers are prolific producers of catfish, buffalo fish, and German carp, which are even shipped to New York and Boston in competition with local fish. Fresh-water mussels are exploited in the manufacture of pearl buttons.

The import trade, largely through New York and Boston, consists chiefly of pickled herring and canned sardines and mackerel from Europe, and fresh haddock, cod, and lobsters from Canada; from Japan canned crab meat and sardines. In 1892 the imports were valued at $5,457,785, in 1906 at $11,446,671, and in 1914 at $18,758,143. The value of exports, chiefly to Europe and the West Indies, in 1906 was $6,422,748, and in 1914, $13,103,000.

For details, see FISH, FISH CULTURE, FISHERIES, FISHING LAWS, SEALING, WHALING, ETC.; on the various species of fishes, COD, MACKEREL, MENHADEN, ETC.; also the various State articles.

Mineral Resources. Prior to the nineteenth century the mining industry in the United States was quite insignificant, and it was not until nearly 1850 that it began to be important. Since that period the industry has developed with a rapidity equal to that of manufactures and transportation. It is significant that the production of the mines constitutes over one-half of the total freight tonnage handled by the railroads. By 1905 the United States had advanced to first rank in the production of most of the useful minerals, and the total value of the combined mineral output was far greater than that of any other country. The growth of the industry since 1880 is seen in the accompanying table.

PRODUCTION AND VALUE OF PRINCIPAL MINERALS FOR 1880 TO 1914

EXPRESSED IN THOUSANDS

	1880		1890		1900		1910		1914	
	Am't	Value	Am't	Value	Am't	Value	Am't	Value	Am't	Value
Aluminium, pounds	....	....	61	$61	7,150	$1,920	47,734	$8,956	79,129	$14,523
Copper, " ...	60,480	$11,491	259,763	40,523	606,117	98,494	1,080,160	137,180	1,150,137	152,568
Gold, fine ounces..	1,741	36,000	1,589	32,845	3,830	79,171	4,657	92,269	4,573	94,532
Iron, pig; long tons	3,375	89,316	9,203	151,200	13,789	259,944	26,674	412,162	22,263	298,777
Lead, short tons...	96	9,573	140	12,575	261	22,961	375	41,384	513	42,286
Silver, fine ounces .	30,319	34,717	54,516	57,242	57,647	35,741	57,138	30,855	72,455	40,068
Zinc, short tons...	23	2,277	64	7,005	124	10,902	252	27,268	343	35,029
Cement, barrels...	2,073	1,853	7,777	4,527	17,231	13,284	77,785	68,752	89,050	82,204
Clay products.....	....	....	....	....	....	96,212	....	70,116	....	164,987
Coal, short tons...	71,482	95,640	157,771	176,804	269,684	306,688	501,596	629,557	513,490	681,490
Coke, " "...	3,338	6,631	11,508	23,215	20,533	47,443	41,709	99,743	34,556	88,334
Lime.............	....	19,000	....	8,288	....	6,797	3,506	14,088	3,381	13,247
Natural gas........	....	....	....	18,793	....	23,699	....	70,756	....	94,116
Petroleum, bbls....	26,286	24,601	45,824	35,365	63,621	75,989	209,557	129,900	265,763	214,125
Salt ....".....	5,961	4,830	8,877	4,752	20,869	6,945	30,306	7,900	34,805	10,271
Stone.............	....	20,626	....	49,761	....	36,971	....	76,521	....	77,412
Sulphur, long tons.	0.5	21	†1	40	3	88	255	4,605	328	5,954
Total metallic.....	....	185,649	....	292,650	....	511,633	....	749,876	....	691,000
Total nonmetallic .	....	173,279	....	312,827	....	594,399	....	1,241,040	....	1,423,396
Total mineral products............	....	364,928	....	606,476	....	1,107,031	....	1,991,216	....	2,114,946

† For 1891.

To the above should be added an unspecified sum amounting in value to $6,000,000 in 1880, to $1,000,000 in 1890 and 1900, to $300,000 in 1910, and $550,000 in 1914. The United States probably has more mineral lands in proportion to its total area than any other country. Nearly every mineral that is used in the arts is mined. These are discussed under their own heads, as COAL, IRON, GOLD, ETC., and in the sections on *Mining* in the articles on the various States. The following paragraphs, however, summarize the production of the more important minerals.

Coal.—Coal is the most widely distributed mineral and is far in advance of any other in the annual value of its output. It is regularly mined in 30 States. The area of the coal fields exceeds 300,000 square miles, of which only a small portion consists of anthracite (q.v.); this is almost wholly confined to the middle-eastern portion of Pennsylvania. Bituminous coal mining began regularly in 1750, while anthracite mining did not begin until 50 years later. The rapid growth of the industry began after the Civil War and was such that the output of bituminous coal doubled for each decade from 1870 to 1890 and since that time has increased at a rate but little smaller. The output of anthracite increased from 967,108 tons in 1840 to 15,664,275 tons in 1870 and to 90,821,507 tons in 1914. The total production of coal in short tons in 1870 was 33,035,580; in 1880, 71,481,570; in 1890, 157,770,963; in 1900, 269,684,027; in 1910, 501,596,378. The accompanying table shows in short tons the production of coal in the leading States in the years 1870, 1880, 1890, 1900, 1910, and 1914.

STATE	1870	1880	1890	1900	1910	1914
Pennsylvania (anthracite)	15,650,275	26,249,711	46,468,640	57,367,915	84,485,236	90,821,507
Pennsylvania (bituminous)	7,798,517	21,280,000	43,302,173	79,842,326	150,521,526	147,983,294
Illinois	2,624,163	4,480,000	15,274,727	25,767,981	45,900,246	57,589,197
Ohio	2,527,284	7,840,000	13,203,522	18,988,150	34,209,668	18,843,115
West Virginia	618,878	1,404,008	6,002,800	22,647,207	61,671,019	71,707,626
Alabama	10,999	380,000	4,090,409	8,394,275	16,111,462	15,593,422
Indiana	437,870	1,680,000	3,305,737	6,484,086	18,389,815	16,641,132
Kentucky	150,582	1,120,000	2,483,144	5,328,964	14,623,319	20,382,763

In 1913 the total coal production in the United States was 569,960,219 tons, the record output up to 1915. See COAL.

Petroleum.—The production of petroleum began in western Pennsylvania in 1859. The United States soon became the chief source of the world's supply and, except for a few years when Russia surpassed it, has held an unquestioned primacy. The principal producing States and their production in barrels in 1914 were: California, 99,775,327; Oklahoma, 73,631,724; Illinois, 21,919,749; Texas, 20,068,184; Louisiana, 14,309,435; West Virginia, 9,680,033; Pennsylvania, 9,170,335; Ohio, 8,536,352. See PETROLEUM.

Iron.—Iron making ranks in importance next to coal, iron ore, like coal, being very widely distributed in the United States, 27 States reporting its production in 1914. The mining of iron began in early Colonial days, but it did not rise into importance until near the middle of the nineteenth century. Of the total output in 1914 the hematite variety amounted to 38,286,670 long tons (maximum output, 57,933,251 long tons in 1913). The Lake Superior ore is almost wholly red hematite, which represents about nine-tenths of the ore mined in the United States. The development of the Lake Superior iron region is one of the most significant of recent industrial movements in the United States. It has been rendered possible largely through the advantage afforded by the Great Lakes for transportation. In the principal mining range, Mesaba, the ore is sometimes found so near the surface that with the removal of a few feet of earth it is mined by the open-pit method, the ore being scooped by huge steam shovels directly from the pit to the car. Probably in no other mines in the world does massive machinery play so great a part in mining operations and hand labor so little. See IRON; IRON AND STEEL, METALLURGY OF.

PRODUCTION OF IRON ORE IN LONG TONS

STATE	1850	1891	1901	1910	1914
Minnesota	....	645,105	11,109,537	31,966,769	21,946,901
Michigan	2,700	6,127,001	9,654,067	13,303,906	10,796,200
Alabama	1,838	1,986,830	2,801,732	4,801,275	4,838,959
Pennsylvania	877,283	1,272,928	1,040,684	739,799	406,326
Virginia and West Virginia	67,319	665,116	925,394	*903,377	*378,520
New York	46,385	1,017,216	420,218	1,287,209	785,377
Wisconsin	......	....	....	1,149,551	886,512

* Virginia only.

Gold.—The mining of gold on an extensive scale did not begin until the discovery of the placer gold in California in 1848. Between 1820 and 1830 some interest had developed in the States of Virginia and North and South Carolina, and for a number of years the output averaged about $1,000,000. In 1850, within two years after the California discoveries, the output was $50,000,000, and it did not fall below this figure until 1860. The product greatly exceeded in total value all other minerals mined during that period. The gold output has ever since been large, though subject to fluctuation. As ordinary placer mining began to be unprofitable, quartz mining and hydraulic mining were resorted to, and California continued to be an important gold-mining State. See GOLD.

Silver.—The development of silver mining in the United States was almost as sudden as was that of gold. The production of this metal had been quite insignificant until the discovery of the Comstock Lode (q.v.) in western Nevada in 1859. The United States then became the leading silver-mining country of the world. The only other nation that now competes with it in this industry is Mexico. The output of the Comstock Lode declined rapidly after 1877. Nevertheless other mines were developing, and the silver product of the country continued to increase, Nevada leading in 1914 with 15,455,491 fine ounces. The two largest contributing sources to this increase were the lead mines of Colorado, and later the copper mines of Idaho, Arizona, Utah, and Montana, large quantities of silver being extracted from both the lead and the copper ores. See SILVER.

Copper.—Very little copper was mined prior to the development of the Lake Superior copper mines, which began operations in 1845. From that year, when the production was 224,000 pounds, the product has continued to increase steadily and rapidly. In 1866 the famous Calumet and Hecla mine was opened, and in 1890 its annual product had grown to 59,868,106 pounds and in 1905 to 100,000,000 pounds, amounting in 1914 to 1,150,137,192 pounds and in 1915 to 1,647,000 pounds, with a probable increase in 1916 to over 200,000,000 pounds. In 1880 Lake Superior ores furnished 82.2 per cent of the total product of the country. See Copper.

Lead.—The United States ranks first among the countries of the world in the production of lead. The mining of this mineral began as early as 1720 in the southwestern part of what is now Missouri, but it was not until a century later that operations assumed much importance. For a number of years the mining of lead was, after iron, the most important metal-mining industry in the United States. Lead was mined in Utah in 1858. About 1877 work began on the Leadville mines, Colorado. The Leadville ores are argentiferous, and the silver obtained in the early days of mining was of greater value than the lead itself. A little later argentiferous lead mines were developed in Idaho (Cœur d'Alene) and other Cordilleran States. See Lead.

Stone.—Stone suitable for building and other industrial purposes is abundant in almost every State. Because of its bulk and the consequent shipping expenses, its production is largely limited to a comparatively local market. Hence in many of the States which have the most valuable resources of stone the quarrying industry has scarcely more than begun. The utilization of stone varies with the economic condition of the country, the total value having fallen from $53,035,620 in 1889 to $31,346,171 in 1896, and advanced steadily to $77,412,292 in 1914. See Building Stone.

AGRICULTURE

The United States produces a larger value of agricultural products than any other country. In 1915 the total value of crops and animal products was about $10,000,000,000. Until the last quarter of the nineteenth century agriculture strongly predominated in the industrial life of the nation. It still employs a much greater number of individuals than any other industry. Owing to the vast area and great variety of physical and climatic conditions, most of the staple products known to the world can be raised. To the Mississippi valley, which stands preëminent for agricultural purposes, are being added vast areas of the West and Northwest which are being rapidly brought under cultivation. If to the arable portion of the Mississippi drainage basin be added the area drained into the Gulf of Mexico by other streams, it would include about one-third of the country's total area. In this division, almost unbroken by mountain or swamp, the soil is generally fertile.

The Appalachian and Atlantic seaboard region contains much broken and rocky land, and soil of only moderate or of inferior quality. Throughout the eastern half of the United States the rainfall is ordinarily sufficient for growth of crops. Westward, however, in the longitude of central Kansas, the rainfall is greatly diminished and irrigation, dry farming, and grazing are followed. The Gulf of Mexico has a decidedly moderating effect on the climate of the Gulf States, particularly Florida. But there is no protection in this region against the cold winds from the north which occasionally sweep southward and bring frosts even to that State. Although much farther south than south Europe, the Gulf region is less adapted to the growing of subtropical products. The Appalachian Mountains and the Atlantic Ocean together have a somewhat moderating effect upon the Carolina-Virginia region and the region farther north; hence this area has an advantage in the raising of some products, especially fruit. In the north the lakes have a moderating influence, making some sections of that territory also favorable for fruit growing. On the Pacific coast the ocean currents and the mountains together afford the most highly protected portion of the United States and make it well adapted as a fruit region.

Area of Farms and Improved Land. In the following table it will be seen that the total farm area of the United States increased in the last half of the nineteenth century nearly threefold.

ACRES OF LAND IN FARMS

CENSUS YEAR	Total	Improved
1850	293,560,614	113,032,614
1860	407,212,538	163,110,720
1870	407,735,041	188,921,099
1880	536,081,835	284,771,042
1890	623,218,619	357,616,755
1900	841,201,546	414,793,191
1910	878,798,325	478,451,750

The largest absolute increase in the acreage of farm land between 1900 and 1910 occurred in the West North Central division, which at both censuses comprised a larger area than any other division. The highest rate of increase was in the Mountain division, 28.3 per cent. More than five-sixths of the improved farm land of the United States in 1910 was in the two North Central and the two South Central divisions. The following table shows the acreage of improved land and the total land area in 1910.

DIVISION	Total land area (acres)	Total land in farms (acres)	Per cent of total land area in farms	Improved land in farms (acres)	Per cent of farm land improved
United States	1,903,289,600	878,798,325	56.2	478,451,750	54.4
New England	39,664,640	19,714,931	49.7	7,254,904	36.8
Middle Atlantic	64,000,000	43,191,056	67.5	29,320,894	67.9
East North Central	157,160,960	117,929,148	75.0	88,947,228	75.4
West North Central	326,914,560	232,648,121	71.2	164,284,862	70.6
South Atlantic	172,205,440	102,782,255	60.2	48,479,733	46.7
East South Central	114,885,760	81,520,629	71.0	43,946,846	53.9
West South Central	275,037,440	169,149,976	61.5	58,264,273	34.4
Mountain	549,840,000	59,533,420	10.8	15,915,002	26.7
Pacific	203,580,800	51,328,789	25.0	22,038,008	42.9

The most noteworthy fact shown is the great importance, absolutely and proportionately, of the North Central divisions. Nearly three-fourths of the total farm area in this section is improved. There are but few large regions in the world so easily and uniformly adaptable to cultivation. In Iowa 95.4 per cent of the total land area was in farms in 1910, and of this 86.4 per cent was improved. Illinois makes almost an equally good showing, and Indiana, Ohio, North Dakota, Missouri, and Minnesota are other States in this group which have a large percentage of improved land.

AVERAGE NUMBER OF ACRES PER FARM BY GEOGRAPHIC DIVISIONS

GEOGRAPHIC DIVISION	1910	1900	1890	1880	1870	1860	1850
The United States	138.1	146.2	136.5	133.7	153.3	199.2	202.6
North Atlantic	112.9	96.5	95.3	97.7	104.3	108.1	112.6
South Atlantic	93.3	108.4	133.6	157.4	241.1	352.8	376.4
North Central	105.1	144.5	133.4	121.9	123.7	139.7	143.3
South Central	236.2	155.4	144.0	150.6	194.4	321.4	321.0
Western	296.9	386.1	324.1	312.9	336.4	366.9	649.9

Size of Farms. From the table above it will be seen that the size of farms varies greatly in different parts of the country.

The most fundamental principle in determining the size of the American farm is the character of the land and the type of farming. The average size of farms is smaller in the older sections of the country than in the newer and is smaller in the South where leased to tenants than in the North. The recent settlement of the West, in which the average homestead (160 acres) was adapted to the average family, has tended to establish this unit. In the South, where the plantation system formerly prevailed, a rapid breaking up is taking place to suit the family unit. The size of farm that a family can cultivate varies with the type of farming. Thus the same labor that will suffice for a grain or stock farm of a given size is sufficient for only one-half or less of that amount when a cotton farm is in question.

Farm Tenure. As the country becomes older there is a rapidly increasing and almost universal tendency towards the renting system, though this is much more marked in some regions than in others. In the earlier period of development the man of small means took a claim, but now he is forced to rent. The frontier, as it pushed across the country, has been characterized by the fact that most of its farms were operated by owners. In the table below it will be seen that the highest percentage of owned farms is in the West, but the renting of farms began at once and steadily increased.

YEAR	Total farms	NUMBER OF FARMS OPERATED BY		
		Owners	Cash tenants	Share tenants
1910	6,361,502	3,948,722	712,294	1,528,389
1900	5,739,657	3,713,371	752,920	1,273,366
1890	4,564,641	3,269,728	454,659	840,254
1880	4,008,907	2,984,306	322,357	702,244

There is an increased tendency to delegate the management of farms. In the South and North Central States especially a large number of the owners are absentees. The table in the next column shows the number of owned and rented farms and the tenancy in each class.

The percentage of rented farms and the rate of increase of these are greatest in the South. The greater proportionate number of rented farms in that section results from the industrial change incident to the overthrow of slavery, many negroes becoming renters, although an increasing number are acquiring land. (See Negro in America.) Rented farms average less in size than the owned farms, and a larger percentage of the rented farms is improved. This is particularly true in the South and is most noticeable in share-rent farms. Farms in that section are leased mainly for raising crops. Farms in the United States are usually rented for short periods, one year at a time being the most common. In Great Britain, by contrast, the long-term system of tenure prevails.

DIVISION	Total number of farms	NUMBER OF FARMS OPERATED BY		
		Owners and managers	Cash tenants	Share tenants
New England				
1910	188,802	173,787	12,188	2,827
1900	191,888	173,930	13,022	4,936
1890	189,961	172,243	10,906	6,812
1880	207,232	189,572	10,230	7,430
Middle Atlantic				
1910	468,379	364,108	47,081	57,190
1900	485,618	362,794	53,339	69,485
1890	468,608	365,133	41,214	62,261
1880	488,907	395,275	38,781	54,851
East North Central				
1910	1,123,489	819,892	99,334	204,263
1900	1,135,823	837,537	95,165	203,121
1890	1,009,031	778,517	74,486	156,028
1880	985,273	783,782	52,770	148,721
West North Central				
1910	1,109,948	767,330	124,539	218,079
1900	1,060,744	746,304	112,567	201,873
1890	914,791	695,569	72,762	146,460
1880	712,695	566,443	35,973	110,279
South Atlantic				
1910	1,111,881	601,452	200,931	309,498
1900	962,225	536,627	172,699	252,899
1890	749,600	461,057	96,098	192,445
1880	644,429	411,673	74,946	157,810
East South Central				
1910	1,042,480	513,742	208,260	320,478
1900	903,313	468,382	190,153	244,778
1890	655,766	404,350	103,583	147,833
1880	569,739	360,309	76,418	133,012
West South Central				
1910	943,186	445,601	106,220	391,365
1900	754,853	384,238	95,938	274,677
1890	431,006	264,622	48,318	118,066
1880	316,909	205,247	28,674	82,988
Mountain				
1910	183,446	163,756	8,726	10,964
1900	101,327	88,918	4,730	7,679
1890	49,398	45,895	1,094	2,409
1880	25,043	23,199	406	1,438
Pacific				
1910	189,981	157,158	19,008	13,725
1900	141,581	113,678	14,052	13,851
1890	96,480	82,342	6,198	7,940
1880	58,680	48,806	4,159	5,715

Methods. See Agriculture.

Irrigation. Within the territory now comprising the arid region of the United States irrigation has been practiced to a limited extent from prehistoric times. When the Spanish explorers entered the territory now forming the States of New Mexico and Arizona, they came across the remains of ancient aqueducts and found the natives watering their crops. The Spaniards who settled in this territory continued and extended this practice, as the country was uninhabitable without it. The area irrigated was very limited, however, being confined principally to the pueblos of the Indians and the missions of the Roman Catholic fathers, until about the middle of the nineteenth century, when American settlers began to go into the West from the East and North. The beginning of irrigation in the United States by Americans is usually attributed to Brigham Young and the Mormon pioneers who settled in the Salt Lake valley in 1847. The fact is that in many parts of the West irrigation was necessary for obtaining subsistence, and wherever permanent settlements were made the settlers began applying water to the soil for the production of crops. The settlement of the Mormons in Utah and the discovery of gold in California occurred at about the same time, and both the Mormon farmers and the California miners were compelled to use irrigation in order to subsist.

In 1870 the first colony of any considerable size depending on irrigated agriculture, aside from the Mormon colony, was founded at Greeley, Colo., under the patronage of Horace Greeley. The first period of active construction of irrigation works on a large scale occurred in the late eighties and early nineties, when many large enterprises were undertaken by promoters who hoped to profit by the great increase in land values created by irrigation. Few of these undertakings were successful financially. This boom in irrigation construction was followed by a long period of depression, lasting until 1902 or 1903, during which little construction took place. In 1902 Congress enacted the Reclamation Law, providing for the construction of irrigation works by the Federal government with the proceeds from the sale of public lands, and at about the same time construction by private enterprises was renewed.

The first statistics of irrigated lands in the United States were collected in connection with the census of 1890. Figures for the farms and acreage irrigated and the cost of irrigation works in the arid region, as reported in the censuses of 1890, 1900, and 1910, are given in the following table:

STATE	FARMS IRRIGATED			ACREAGE IRRIGATED			COST OF IRRIGATION WORKS		
	1909	1899	1889	1909	1899	1889	1910	1899	1889
Total	158,713	107,489	54,136	13,738,485	7,518,527	3,631,381	$307,866,369	$66,962,275	†$29,611,000
Arisona	4,841	2,981	1,075	320,051	185,396	65,821	17,677,966	4,438,352	465,000
California	39,352	25,611	13,732	2,664,104	1,445,872	1,004,233	72,580,030	19,181,610	13,005,000
Colorado	25,857	17,613	9,659	2,792,032	1,611,172	890,735	56,636,443	11,758,703	6,369,000
Idaho	16,439	8,987	4,323	1,430,848	602,568	217,005	40,977,688	5,120,399	1,209,000
Kansas	1,006	929	519	37,479	23,620	20,818	1,365,563	529,755	‡
Montana	8,970	8,043	3,706	1,679,084	951,154	350,582	22,970,958	4,683,073	1,623,000
Nebraska	1,852	1,932	214	255,950	148,538	11,744	7,798,310	1,310,698	‡
Nevada	2,406	1,906	1,167	701,833	504,168	224,403	6,721,924	1,537,559	1,251,000
New Mexico	12,795	7,884	3,085	461,718	203,893	91,745	9,154,897	4,165,312	512,000
North Dakota	69	54	7	10,248	4,872	445	836,482	16,980	‡
Oklahoma	187	124	......	4,388	2,759	....	47,200	21,872	....
Oregon	6,669	4,636	3,150	686,129	388,310	177,944	12,760,214	1,843,771	826,000
South Dakota	500	606	189	63,248	43,676	15,717	3,043,140	284,747	‡
Texas*	4,150	1,252	623	164,288	40,592	18,241	7,346,706	705,608	‡
Utah	19,709	17,924	9,724	999,410	629,293	263,473	14,028,717	5,865,302	2,780,000
Washington	7,664	3,286	1,046	334,378	126,307	48,799	16,219,149	1,525,369	197,000
Wyoming	6,297	3,721	1,917	1,133,302	605,878	229,676	17,700,980	3,973,165	1,281,000

* Exclusive of land irrigated for rice.
† Includes $273,000 for States for which separate figures are not available.
‡ Separate figures not available.

The irrigated land of the United States is supplied with water principally from streams, 94 per cent of the acreage irrigated in 1909 being supplied from this source, 3.3 per cent being supplied from wells, 1.4 per cent from springs, and the remainder from reservoirs and lakes. The normal summer flow of most of the streams of the arid region is utilized. Irrigation works have been constructed by individuals, coöperative companies, commercial enterprises, irrigation districts, and the Federal government. The coöperative companies are usually joint-stock companies; irrigation districts are organized under State laws authorizing the issuing of bonds, to obtain funds to meet the cost of works and the levy and collection of taxes on the lands composing the districts to pay the bonds, interest, and operating expenses. The Carey Act is a Federal law granting lands to the States containing arid lands on condition that the States provide for reclamation by irrigation; and the Reclamation Law provides for the construction of irrigation works by the Federal government with the proceeds of the sale of public lands and for the repayment of the cost of such works by the users of the water supplied by the works. Of the acreage irrigated in 1909, 45.5 per cent was supplied with water by individual and partnership enterprises, 33.8 per cent by coöperative enterprises, 10.6 per cent by commercial enterprises, 3.8 per cent by irrigation districts, 2.1 per cent by Carey Act enterprises, 2.9 per cent by United States reclamation enterprises, and 1.3 per cent by United States Indian Service enterprises.

The crops grown under irrigation in the United States consist principally of hay and grain. In 1909 forage formed 63 per cent of the total acreage of irrigated crops reported, grain 23 per cent, fruit 5 per cent, and sugar beets and potatoes about 2.5 per cent each. Alfalfa alone showed more than 30 per cent of the total acreage of irrigated crops.

Crops. The following table shows the development and distribution of some of the principal crops, as returned by the Bureau of the Census for 1899, 1909, and estimated by the Department of Agriculture for 1915. The most important crops are corn, hay, wheat, and oats. These cover about nine-tenths of the entire crop area of the United States.

ACREAGE, PRODUCTION, AND VALUE OF PRINCIPAL CROPS FOR THE UNITED STATES AND MAIN DIVISIONS FOR 1915,* 1909, AND 1899

CROPS	YEAR	UNITED STATES			NORTH ATLANTIC STATES			SOUTH ATLANTIC STATES		
		Acreage	Production in bushels	Value	Acreage	Production in bushels	Value	Acreage	Production in bushels	Value
Corn	1915	108,321,000	3,054,535,000	$1,735,859,000	2,620,000	103,522,000	$76,288,000	13,880,000	294,785,000	$220,580,000
	1909	98,382,665	2,552,189,630	1,438,553,919	2,340,619	77,818,996	50,994,265	11,386,984	179,511,702	149,479,304
	1899	94,913,673	2,666,324,370	828,192,388	2,633,120	90,681,350	39,588,417	12,024,742	169,468,960	74,406,051
Hay	1915	50,872,000	† 85,225,000	412,320,000	11,542,000	† 15,193,000	246,344,000	2,811,000	† 3,932,000	61,611,000
	1909	72,280,000	97,453,735	824,004,877	12,330,391	15,962,084	189,724,320	2,856,398	2,917,870	37,836,676
	1899	61,691,069	79,251,562	484,254,703	12,919,041	15,123,311	141,959,434	2,161,201	2,194,115	28,926,431
Cotton	1915	30,957,000	‡11,161,000	602,393,000	....	....	....	8,584,000	‡ 3,834,000	208,320,000
	1909	32,043,838	10,649,268	703,619,303	....	....	....	9,002,776	4,012,942	254,636,995
	1899	24,275,013	9,534,707	323,758,171	....	....	....	6,842,489	2,701,766	90,759,735
Wheat	1915	59,898,000	1,011,505,000	430,302,000	1,803,000	36,057,000	37,248,000	2,613,000	47,258,000	51,801,000
	1909	44,262,592	683,379,259	657,656,801	1,603,218	29,832,831	31,787,573	2,241,345	26,650,768	28,725,004
	1899	52,588,574	658,534,252	369,945,320	2,213,587	33,114,070	22,540,965	3,368,872	31,906,857	22,903,064
Oats	1915	40,780,000	1,540,362,000	555,569,000	2,819,000	110,696,000	49,833,000	2,235,000	47,662,000	29,863,000
	1909	35,159,441	1,007,142,980	414,697,422	2,742,107	71,695,316	37,139,074	1,368,832	13,388,578	13,388,578
	1899	29,539,698	943,389,375	217,098,584	2,792,296	87,273,495	27,220,575	1,268,061	14,874,898	5,869,687
Potatoes	1915	3,761,000	359,103,000	221,105,000	975,000	66,532,000	66,815,000	319,000	34,673,000	23,353,000
	1909	3,668,855	389,194,000	166,423,910	962,418	119,641,713	44,749,447	237,762	22,102,630	14,081,735
	1899	2,938,778	273,318,167	98,380,110	856,428	87,838,981	36,700,836	157,481	12,150,748	6,691,072
Tobacco	1915	1,368,000	§1,060,587,000	96,041,000	65,500	§ 85,940,000	10,692,000	616,400	§412,631,000	41,958,000
	1909	1,294,911	1,055,764,806	104,302,856	68,597	89,472,818	9,998,856	487,411	334,569,496	32,843,156
	1899	1,101,460	868,112,865	56,987,902	53,281	79,272,234	8,233,051	465,754	300,194,090	18,627,038
Flaxseed	1915	1,367,000	13,845,000	24,080,000	....	....	....	....	....	....
	1909	2,083,142	19,512,765	28,970,554	....	....	....	....	....	....
	1899	2,110,517	19,979,492	19,624,901	....	....	....	....	....	....
Barley	1915	7,395,000	237,009,000	122,499,000	111,000	3,538,000	2,655,000	17,000	518,000	380,000
	1909	7,698,706	173,344,212	92,458,571	103,975	2,490,806	1,757,025	15,561	409,615	276,981
	1899	4,470,196	119,634,877	41,631,762	145,131	3,850,175	1,857,874	5,717	109,559	53,245
Rye	1915	2,856,000	49,190,000	41,295,000	506,000	9,381,000	8,286,000	177,000	2,376,000	2,333,000
	1909	2,195,561	29,520,457	20,421,812	485,353	6,688,933	5,166,024	157,546	1,322,474	1,106,617
	1899	2,054,292	25,568,625	12,290,540	575,086	7,525,794	4,085,577	114,319	862,549	493,519
Rice	1915	803,000	28,947,000	26,212,000	....	....	....	5,300	132,000	116,000
	1909	610,175	21,838,580	16,019,607	....	....	....	27,080	713,966	691,372
	1899	342,214	9,002,886	6,329,562	....	....	....	127,369	2,470,725	2,000,996
Buckwheat	1915	806,000	15,769,000	12,408,000	591,000	11,960,000	9,444,000	88,000	1,807,000	1,429,000
	1909	878,048	14,849,332	9,330,692	620,884	11,304,348	7,025,794	84,864	1,216,608	791,546
	1899	807,060	11,233,515	5,747,853	598,231	8,779,941	4,462,224	55,542	704,147	341,567

* Estimated. † Tons of 2000 pounds. ‡ Bales. § Pounds.

Corn.—The largest and most valuable American crops are corn and hay. They are at the basis of the great stock-raising interests of the country. Corn stands without a rival either in respect to area or value. It is indigenous to America, and the United States produces about four-fifths of the world's supply. It has about as large an acreage as all other cereals combined. See MAIZE.

Hay.—As compared with corn, hay is of greater relative importance in regions which are not well adapted for the growing of corn, but where the demand for stock food is nevertheless great. Thus in the North Atlantic

States the acreage of hay is twice the total area devoted to cereals, and in the western division of States the acreage of hay is over 16 times that of corn and nearly 30 per cent greater than that of all cereals combined. In the latter region a large part of the crop has the advantage of irrigation. In most of the North Central States hay is the second crop in respect to acreage and value. In the cotton States less attention is given it, although there has been a significant increase in this section in recent years. (See Table.) The increase in the acreage of hay has been especially rapid since 1880, the area devoted to it having doubled since that time, corresponding to a period in which there was a decadence in wheat culture. The principal variety of hay is timothy, its production being confined largely to the North Central and the North Atlantic States. Next in importance are wild, salt, and prairie grasses,

ACREAGE, PRODUCTION, AND VALUE OF PRINCIPAL CROPS—*Continued*

CROPS	YEAR	NORTH CENTRAL STATES			SOUTH CENTRAL STATES			WESTERN STATES		
		Acreage	Production in bushels	Value	Acreage	Production in bushels	Value	Acreage	Production in bushels	Value
Corn..........	1915	59,259,000	1,883,629,000	$1,006,758,000	31,400,000	750,325,000	$436,621,000	862,000	23,274,000	$15,612,000
	1909	57,855,489	1,841,657,282	937,689,285	26,240,335	443,556,924	294,011,151	559,239	9,614,736	6,379,904
	1899	57,119,558	1,941,220,100	535,443,048	22,894,637	460,250,905	171,463,242	241,616	4,703,055	2,291,630
Hay..........	1915	24,572,000	† 42,394,000	377,796,000	3,835,000	† 6,154,000	65,303,000	8,112,000	† 17,552,000	160,266,000
	1909	32,149,136	56,717,729	396,012,971	5,767,845	5,948,726	59,427,982	9,181,006	15,907,326	141,002,928
	1899	35,676,042	46,158,805	221,866,406	3,883,662	5,083,325	30,663,233	7,051,123	10,687,006	60,839,199
Cotton........	1915	‖ 102,000	‡ ‖ 52,000	‖ 2,740,000	22,220,000	‡ 7,235,000	389,189,000	¶ 34,000	‡ ¶ 34,000	¶ 1,822,000
	1909	96,563	54,508	3,393,040	22,943,366	6,581,418	345,562,286	1,133	399	26,982
	1899	45,749	25,646	851,478	17,386,807	6,807,257	232,144,715	56	38	2,243
Wheat........	1915	40,435,000	686,888,000	633,938,000	6,710,000	82,382,000	81,513,000	6,482,000	159,772,000	131,283,000
	1909	32,902,920	505,184,796	485,808,812	2,871,330	32,470,549	33,129,628	4,644,769	89,235,315	78,205,784
	1899	35,496,201	441,300,918	244,332,629	5,922,170	61,901,477	35,887,396	5,587,744	90,314,930	44,281,166
Oats..........	1915	28,669,000	1,142,993,000	377,213,000	4,562,000	174,656,000	56,184,000	2,495,000	1,127,730,000	42,476,000
	1909	16,935,940	806,464,050	311,651,402	2,147,296	38,920,382	19,299,527	1,965,266	68,857,232	33,218,841
	1899	22,196,879	764,279,166	161,851,358	2,328,291	47,407,503	11,907,304	954,171	29,554,323	10,249,660
Potatoes......	1915	1,859,000	167,435,000	84,612,000	253,000	22,017,000	16,590,000	365,000	48,626,000	29,634,000
	1909	1,889,845	183,674,328	67,515,226	237,302	17,230,047	11,380,288	339,528	26,546,247	18,687,214
	1899	1,594,377	141,800,447	41,026,001	153,014	9,919,416	5,076,645	177,478	21,608,575	8,885,556
Tobacco.......	1915	152,400	§ 136,315,000	11,064,000	534,100	§426,701,000	32,327,000	**........	**........	**........
	1909	177,682	163,664,357	15,796,213	562,206	468,048,987	45,663,168	15	9,148	1,463
	1899	120,516	123,201,591	8,544,422	461,855	365,413,140	21,577,675	54	311,950	55,581
Flaxseed......	1915	1,184,000	11,920,000	20,810,000	....	....	....	183,000	1,925,000	3,262,000
	1909	2,039,670	19,019,162	28,242,837	....	....	....	42,004	469,824	707,018
	1899	2,085,837	19,797,674	19,461,175	....	....	....	20,760	158,443	143,734
Barley........	1915	5,066,000	161,454,000	77,523,000	29,000	788,000	524,000	2,172,000	70,711,000	41,398,000
	1909	5,770,020	125,702,708	52,641,478	19,541	391,268	187,006	1,789,499	44,439,815	27,596,079
	1899	2,970,959	81,560,497	25,661,317	24,182	475,763	137,071	1,324,207	33,638,883	13,922,255
Rye...........	1915	2,014,000	34,204,000	28,617,000	55,000	642,000	627,000	104,000	1,864,000	1,434,000
	1909	1,439,140	20,450,974	13,228,144	56,017	449,846	378,317	57,505	708,220	542,710
	1899	1,232,709	15,998,204	7,081,873	46,567	379,990	222,807	85,611	802,088	406,764
Rice..........	1915	....	....	....	763,100	26,437,000	24,045,000	¶ 34,000	¶ 2,268,000	¶ 2,041,000
	1909	....	....	....	583,083	21,124,554	15,328,195	....	....	....
	1899	....	....	....	214,845	6,532,161	4,328,556	....	....	....
Buckwheat....	1915	124,000	1,948,000	1,494,000	†† 3,000	††54,000	†† 41,000	**.......	**........	**........
	1909	165,926	2,246,780	1,452,465	4,893	52,512	38,122	1,481	29,064	22,865
	1899	150,862	1,720,089	926,864	1,374	10,476	6,099	1,051	18,862	11,099

† Tons of 2000 pounds.
¶ California.
‡ Bales.
** No estimate made.
§ Pounds.
†† Tennessee.
‖ Missouri.

which are produced in regions in which timothy is little grown—the sale and other marshes, and the more arid prairie region and westward. Alfalfa stands closely in acreage to timothy. Its production is largest in the North Central and the Western States. Two or more cuttings of this crop are obtained annually, and it stands first in yield per acre. Clover grown alone ranks next to alfalfa in acreage, but a larger area is devoted to clover and timothy as a mixed hay crop. In the Far West, especially California, large quantities of grain are cut green for hay. Millet and other hay and forage crops are grown in most parts of the country.

Wheat.—The United States wheat crop varies in amount from one-third to one-half that of Europe. Wheat can be successfully grown in every State of the Union. However, the competition of certain favored regions has limited its cultivation in others. A hardy crop and of quick growth, it is the principal crop in the North and the West. The climate and soil are less favorable to its growth in the South. The extensive wheat farms of former years have been gradually broken up, and mixed farming has taken their place. During the period from 1870 to 1890 wheat cultivation developed in Argentina, India, and other regions, and these countries came into competition with the United States in the European market. This fact, coupled with the high production of the United States, caused a decrease in the price of wheat over the greater part of the country. In the regions where the winters are rigorous, especially where the snowfall is not heavy enough to protect vegetation or where the rainfall may be inadequate in the autumn, the wheat crop is sown in the Spring. In 1915 a little over two-thirds of the total wheat acreage was winter wheat. Wheat benefited even more than corn from the improved machinery which came into use about 1850 and subsequently. This, together with the improvement of transportation and the adaptability of the prairie soils to wheat culture, resulted in a rapid increase in the acreage devoted to the crop.

Cotton.—Nearly 65 per cent of the world's supply of cotton is produced in the United States, where it is one of the leading crops. The area devoted to cotton and the production have been greatly extended in the past half century. According to the United States Bureau of the Census the acreage of cotton harvested by recent census years was: 1879, 14,480,019; 1889, 20,175,270; 1899, 24,275,101; 1901, 32,044,000; and 1914, 36,832,000. The production of cotton lint for the same dates, by running bales, was 5,575,359, 7,472,511, 9,393,242, 10,072,731, and 15,905,840 respectively, the crop for 1914 being the largest ever produced in the country. Reduced to 500-pound bales, which is the usual method now adopted, this crop was 16,134,930 bales. Linters to the value of $7,711,752 were produced in 1914, and the total value of the cottonseed, which was crushed for its oil, hulls, and cake, was $156,036,437. The principal area of cotton production is the region between the Appalachian Mountains and the sea, beginning with the southern tier of counties in Virginia and including more than two-thirds of North Carolina, practically all of South Carolina, Georgia, Alabama, Mississippi, Arkansas, and Oklahoma, most of Texas, and all of Louisiana except the sugar and rice parishes. Most of the cotton area is devoted to the growing of upland types of cotton (*Gossypium hirsutum* and various hybrids), but the finest and most expensive cotton is the Sea Island (*Gossypium barbadense*), which is grown in the coast region of South Carolina, southeastern Georgia, and northern Florida. Locally produced strains of Egyptian cotton are grown in Arizona, and a very superior upland cotton in California.

The cotton-boll weevil menace, which grew to serious proportions in the last decade of the nineteenth century, has been a disturbing factor in cotton production. First appearing in Texas, it gradually spread until it reached nearly to the northern limit of cotton production in Oklahoma and eastward until in 1915 it reached the area of Sea Island cotton in Georgia and Florida. The presence of the boll weevil has probably done more to revolutionize methods of production and to diversify agriculture in the infested regions than any other agency.

Oats.—The only other crop which is grown on a scale comparable with the foregoing crops is oats. The acreage of oats is indeed greater than that of cotton, but the value is much less. In New York, Wisconsin, and some other Commonwealths oats has the largest area of all cereals. In a number of other States it ranks second, including the two largest oats-growing States, Illinois and Iowa, in each of which it is much more extensively grown than wheat. The United States produces less than one-third the oats of the world.

Rice.—Although rice was introduced as early as 1700 and has been grown ever since, it was not until near the year 1900 that its cultivation began to assume large proportions. South Carolina ranked first in its production until 1880. A new epoch in rice cultivation began in 1897–98, when it was successfully grown by the aid of irrigation in the coastal prairie lands of southwest Louisiana. The cultivation of rice in that region developed with remarkable rapidity, and the production of the country increased from 115,000,000 pounds in 1898 to more than 10 times that quantity in 1915. Of this last amount, which was only a little short of the consumption of the country, Louisiana, Texas, Arkansas, and California together produced over 99 per cent.

Other Cereals.—Other varieties of cereals than those mentioned flourish, but have not become favorites as in some other countries. The United States produces only one-tenth of the barley crop of the world and is exceeded by European Russia. It is an important crop in California, where it is used as a stock-food substitute for corn. The other States in which it is most grown are Minnesota, Wisconsin, Iowa, and the Dakotas. The production of rye is greatest in Wisconsin, Pennsylvania, and other Northern States. Pennsylvania and New York produce over five-eighths of the buckwheat of the country. Kafir corn and other nonsaccharine sorghums are adapted to the semiarid regions and are grown chiefly in western Kansas, Oklahoma, and Texas. In 1909 the area in Kafir corn and Milo maize was 1,635,153 acres.

Vegetables.—Vegetables are grown commercially on three classes of farms: intensively cultivated gardens adjoining the large centres of population and devoted to the more perishable; general farms which include the staple fall and winter vegetables in their planting scheme; and truck farms located in mild regions along the South Atlantic and Gulf coasts as well as in southern California, where large quantities of perishable vegetables can be grown in greenhouses. The reported acreage of vegetables, not including potatoes and sweet potatoes, increased from 2,162,130 acres in the census year 1899 to 2,763,269 in 1909. The corresponding values of vegetables increased from $120,282,000 to $216,257,000. The South Atlantic States lead in both acreage and value, having produced $42,605,737 worth of vegetables in 1909. Of the individual States, the leading ones, judged by value of vegetables produced, were New York with $15,963,000, Ohio with $11,394,000, Pennsylvania with $10,014,000, Illinois with $9,392,000, Virginia with $8,989,000, Kentucky with $8,287,000, and Missouri with $8,268,000.

Potatoes.—The most extensively grown and most valuable of the vegetables are potatoes, yet the production is small as compared with that of Europe or even Germany alone. About 78 per cent of both acreage and production was in the Northern States. Among the individual States New York led in production with 48,598,000 bushels, followed by Michigan with 38,244,000 bushels, Wisconsin with 31,968,000 bushels, and Maine with 28,557,000 bushels.

Sweet Potatoes.—More than nine-tenths of the sweet potato crop is grown in the South. The total acreage in 1909 was 641,225 as compared with 537,312 in 1899. The total production was 59,232,000 bushels, or an increase of 39.3 per cent over 1899. The total value increased from $19,870,000 in 1899 to $35,429,000 in 1909. The average yield per acre increased from 79.1 bushels to 92.4 bushels. New Jersey, the most important sweet-potato State in the North, planted 22,504 acres. California had 5111 acres, or more than nine-tenths of the acreage for the entire West.

Fruits.—The most remarkable development of all phases of American agriculture in the two decades, 1890–1910, was made in fruit culture. This industry more than doubled in magnitude in that period. The number of orchard trees, e.g., increased from 193,452,588 to 432,090,629 (not including subtropical varieties). Most varieties of temperate-zone fruits are grown in every State. The use of refrigerator cars has made it possible to transport fruits long distances, and thus all parts of the country have the advantage of the general market. However, climatic differences tend to localize. From the following table it will be seen that the apple has a decided primacy among American fruits.

ORCHARD FRUITS, TREES OF BEARING AGE IN 1910

Apples	151,322,840
Peaches and nectarines	94,506,657
Pears	15,171,524
Plums and prunes	23,445,009
Cherries	11,822,044
Apricots	3,669,714
Quinces	1,154,399
All other	25,090
Total	301,117,277

Formerly the apple received most attention in the Northeastern and North Central group of States, but its commercial culture has rapidly extended southward to northern Georgia and west to the Plains region and to the northwestern States. New York, on account of its old orchards, is still the largest-producing State. Peaches are grown generally throughout the country, but the greatest development has been in the production of early peaches in the South and in California, where the rapid development of the dried-fruit industry has further stimulated the production of all orchard fruits. The Pacific coast, particularly California, leads in the production of plums, prunes, apricots, and grapes. California produced 225,000 tons of dried fruits in 1914, whereas the total production of dried fruit in the United States in 1909 was only 192,500 tons. The total number of grapevines of bearing age in the United States in 1910 was 2,571,065,000, of which California had nearly two-thirds. The raisin industry is confined to California. Besides California, the chief region for the production of wine and table grapes is the Lake Erie region in northern Ohio and western New York. Cherries and pears are grown throughout the country.

The production of the three most important varieties of small fruits—strawberries, raspberries, and blackberries—is well extended over the country. Cranberries require boggy lands and are principally limited to the Cape Cod region, southern New Jersey, and central Wisconsin. Massachusetts produces over 60 per cent of the product. California is unsurpassed as a region for the growing of all kinds of subtropical fruits, as the remarkable development of that region during the period 1880–1910 fully demonstrates. This region is also the chief centre of production of almonds and English walnuts. South Florida is also a large centre of orange culture and is the only important centre of pineapple culture of continental United States. (See CALIFORNIA; FLORIDA.) Arizona and New Mexico also give promise of becoming important centres for the growth of subtropical plants. Of the total value of fruits and nuts in 1909, $140,867,000 was contributed by orchard fruits, $29,974,000 by small fruits, $22,711,000 by citrus fruits, $22,028,000 by grapes, $4,448,000 by nuts, and $1,995,000 by tropical and subtropical fruits other than citrus.

Tobacco.—Virginia maintained the primacy in tobacco production until 1850, when it was surpassed by Kentucky. The latter State has steadily increased, until it represents over twice the acreage and value represented by the former. In the decade 1890–1900 North Carolina more than doubled its acreage and advanced ahead of Virginia. The other principal States producing tobacco are Ohio, Tennessee, South Carolina, Wisconsin, Pennsylvania, Maryland, and Connecticut.

Sugar and Sugar-Producing Crops.—The raising of sugar cane in the United States proper is largely confined to Louisiana. The area devoted to sugar cane in the United States in 1909 aggregated 476,849 acres. The production of cane sugar amounted to over 326,900 tons in 1909 and fell to 203,000 tons in 1915. The production of sugar-cane molasses in 1909 amounted to over 24,592,000 gallons, and of sirup to over 23,000,000 gallons. Sorghum cane is grown very generally throughout the United States. The total acreage in 1909 was 444,089, and the sirup produced amounted to 16,532,000 gallons. In the early history of the country a large part of the sugar and sirup consumed was manufactured from the sap of the maple tree. The maple sugar made in 1909 amounted to 14,060,000 pounds. About two-thirds of this was made in Vermont and New York. The maple-sirup product in the same year amounted to 4,106,000 gallons, Ohio being the leading State in sirup production. Since 1890 there has been a rapid development of the beet-sugar industry. The production of beet sugar increased from 2203 tons in 1889–90 to 750,000 tons in 1915. The latter amount was produced from 624,000 acres of beets. Over two-thirds of this acreage was in Colorado, California, and Michigan, and the remainder was distributed through a number of States. Unlike sugar cane, the sugar beet is usually grown as an incidental to other farming operations. Owing to their high value per acre, they are both, however, important to the sections in which they are grown.

Stock Raising. Compared with crop growing, stock raising is of much more importance in the United States than in European countries. The per capita number of horses, cattle, and hogs is much greater in the United States than in any of the principal European countries. The total value of all live stock on farms in the United States in 1910 was $4,925,174,000. Of the total, the value of domestic animals, $4,760,060,000, represented 96.6 per cent and the value of poultry most of the remainder. The accompanying table shows the number of live stock on farms and ranges in 1900, 1910, and as estimated for 1916:

LIVE STOCK	United States	North Atlantic division	South Atlantic division	North Central division	South Central division	Western division
Neat cattle						
*1916	51,441,000	5,662,000	4,923,000	34,398,000	1,640,000	10,056,000
1910	53,997,327	4,699,130	4,264,112	23,694,947	12,908,805	8,831,053
1900	52,403,828	5,081,616	3,490,301	23,309,460	13,823,384	6,699,067
Dairy cattle						
*1916	21,988,000	3,488,000	1,883,000	10,109,000	4,688,000	1,812,000
1910	20,125,432	3,439,350	1,810,754	10,157,133	3,877,614	1,340,581
1900	17,135,633	3,496,266	1,383,319	8,490,284	2,899,236	866,528
Horses						
*1916	21,166,000	1,669,000	1,120,000	11,836,000	6,451,000	2,889,000
1910	19,220,338	1,572,229	1,082,963	10,854,451	3,388,814	2,351,881
1900	16,952,191	1,641,395	1,014,543	9,070,366	3,175,869	2,050,018
Mules						
*1916	4,565,000	55,000	818,000	1,043,000	2,496,000	153,000
1910	4,206,210	54,800	749,898	954,603	2,283,411	163,498
1900	3,127,152	46,033	545,840	652,360	1,677,607	111,147
Swine						
*1916	63,047,000	2,626,000	7,683,000	37,549,000	17,217,000	2,972,000
1910	58,185,676	2,187,463	5,963,920	35,442,568	12,460,551	1,831,174
1900	62,868,041	2,322,206	5,562,762	40,474,289	13,047,827	1,460,957
Sheep						
*1916	49,162,000	2,589,000	2,241,000	12,073,000	5,044,000	27,711,000
1910	39,144,046	1,566,898	1,552,698	10,059,603	3,176,278	23,288,569
1900	39,144,046	2,533,579	1,706,199	10,055,721	3,328,848	22,228,620

* Estimated by the United States Department of Agriculture as for January 1st.

Little was done prior to the beginning of the nineteenth century to improve the breeds. By the year 1900 the rate of improvement had become very rapid, and at the present has been extended to all classes of live stock in practically all sections of the country.

Horses.—The most distinctive success attained in American horse raising has been in the development of a new and superior breed of race horses. American racers are the best in the world. Vermont early became well known for the raising of driving horses, but the blue-grass region of Kentucky contains a large number of the most famous breeding farms of driving horses in America. (See HORSE.) From the trotting stock are bred roadsters and coach horses, the European breed of coach horse not being extensively bred in the country. The United States has not developed any new breeds of draft horses, but imports stock horses of this kind from Europe. The favorite breeds are the Percheron, Shire, and Clydesdale. The steady growth in the demand for horses prior to about 1890 resulted in the breeding of the low-grade as well as the better class. In recent years the premium paid for high-grade horses has checked the breeding of inferior animals, and since 1890 the grade of horses has improved much faster than before.

Cattle.—The nineteenth century was well advanced before stock cattle from Europe had been imported to any considerable extent. Shorthorns were for several years imported in the largest numbers, and there are more shorthorns in the United States to-day than of any other breed. The hustling qualities of the Herefords made them favorites in the range States. The Aberdeen-Angus were introduced later (1870), but have become rivals of the Herefords for beef purposes, especially in the North Central States. These are the three principal breeds used in the United States for breeding and for grading up native cattle for beef purposes. In feeding and breeding beef cattle it has been the aim to reduce the time necessary to prepare the animal for market and the tendency has been to produce earlier maturing animals. In the North Central division cattle are being finished for market at from 12 to 18 months and known as baby beeves.

The method of cattle raising in the range region has greatly changed since about 1900. Formerly cattle were pastured and driven about without hindrance over government lands. To-day much of the range area is inclosed by wire fences. Part of the former range area has been settled by small farmers, but produces more cattle than under the old system. Instead of letting range cattle shift for themselves in winter, as formerly, it is common to provide food and protection for them.

The recent remarkable development in the dairying industry has exercised a decided influence over cattle raising. The number of milk or dairy cows increased from 6,385,000 in 1850 to 20,625,432 in 1910, while the increase in dairy value of these cattle was proportionately much greater. See CATTLE; DAIRYING.

Swine.—The United States has accomplished more in the development of new and superior breeds of hogs than in that of any other farm animal. Indeed, in both the quality of the breed and in absolute number the United States stands almost alone in this branch of industry.

Until towards 1850 the most common grade was the half-wild, long-legged, thin animals known as razor-backs. They are still common in the Southern States, but before 1830 a distinct breed, the Chester White, had been developed in Chester Co., Pa., and about 1840 another new breed, the Poland China, originated in southwestern Ohio. The Duroc-Jersey, another native breed, first became common in New Jersey, and is now well known over the country. Through these and other improved native breeds, together with the imported Berkshires, the grade of hogs in the North Central States has been improved until it has reached a very high standard. Stockmen have aimed at securing a breed that will fatten quickly and at an early age. The Poland China does this, and its imprint is most noticeable among American hogs.

Sheep.—Sheep hold a much lower rank in the agricultural economy of the United States than in that of most modern nations. The industry has labored under the disadvantages of a vacillating tariff policy. During the middle of the nineteenth century the merino was the prevailing breed, but in 1900 it was estimated that 30 per cent of the flocks in the range country were of mutton breeds, and that from 70 to 80 per cent of those in the farming States had a predominance of English blood. The merino blood still predominates in the range States. The number of sheep in the United States in 1910, outside of the Western division of States, was not so great as in 1850. Sheep raising began to spread rapidly in the Western division about 1870. Since 1890 there has been remarkable development in that region. The foremost sheep-raising States of the Western division are Wyoming, Montana, New Mexico, and Idaho. In New England the dairy industry has supplanted sheep raising, so that the number of sheep in 1910 was less than one-third the number in 1850. Since 1880 there has been a decline in the North Central States, particularly Ohio. Texas in 1890 had attained first rank, but in 1910 had only one-third the number of sheep reported for the earlier year.

Poultry.—The importance of the production of eggs and poultry in the United States is not generally realized. The value of the poultry and the egg products in 1909 was $202,506,272 and $306,688,960 respectively, an increase of 48 and 112.6 per cent since 1899. The egg production for the year amounted to 1,591,311,371 dozen, an increase of 297,648,938 dozen over 1899. This gain was partly due to the greater use of the incubator. The value of the egg product in Ohio, Missouri, and Iowa in 1909 in each State exceeded $19,000,000. The different kinds of fowls in 1900 numbered as follows: chickens, 280,345,133; turkeys, 3,688,708; geese, 4,431,980; ducks, 2,906,525.

Forests and Forest Products. See Forestry; Lumber Industry.

MANUFACTURES

The United States is the foremost manufacturing country in the world. Manufacturing in the United States is of coördinate importance with, if not of greater importance than, either of the two other leading American industries, agriculture and trade and transportation. A statistical summary from the thirteenth census for the more important American manufacturing industries will be found under Manufactures (q.v.). In the export of manufactures the United States in 1915 led all countries with a record of $1,784,000,000, as compared with about $1,500,000,000 for Great Britain, which in normal times would have had first place, with an average export valued at about $2,000,000,000. Previous to the European War Germany also exceeded the United States in its export of manufactured goods, the total amount averaging slightly in excess of $1,500,000,000.

The following are the general statistics of manufactures in 1909, as obtained by the 1910 census:

Number of establishments	268,491
Capital	$18,428,269,706
Wage earners	6,615,046
Wages	$3,427,037,884
Value of materials	$12,142,790,878
Value of products	$20,672,051,870

In a preliminary analysis of the 1914 census returns for manufactures an increase in products amounting in value to some $24,000,000,000 was indicated, as compared with $14,750,000,000 reported for 1904, and $11,500,000,000 in the 1899 census. These figures may be compared with the total returns of the census of production of Great Britain for 1907, viz., some $8,000,000,000, and the approximate figures of between $11,000,000,000 and $12,000,000,000 for 1913 in Germany, and an estimated output from France running about the same as that of Great Britain.

Natural Advantages. The abundance of raw material required by the manufacturing industries, the degree of availability, including transportation facilities, and the capabilities of the producers are unequaled. Both food supplies and agricultural materials for manufacture are cheaper, more abundant, and more varied in the United States than in any other manufacturing country. The well-distributed forests contain most varieties of timber needed in large quantities and in amounts that admit of heavy exportation. In the production of the two minerals which constitute the basis of modern manufactures, coal and iron, the United States ranks foremost and indeed produces more than a third of the world's output of each. Moreover, the deposits of these minerals, together with deposits of limestone, which is needed in fluxing the iron ore, frequently have been found in the same or a neighboring locality.

The transportation facilities include 26,410 miles of navigable streams and a railway mileage (251,984 miles in 1913) that is greater than that of all Europe and is 36.5 per cent of the railroad mileage of the world. The competition of the waterways with the railways has had its effect in giving to the country the advantage of cheap rates. Another advantage about which little is said, but which nevertheless is great, is the freedom of interstate commerce, with a Federal Interstate Commission to prevent unfair discrimination and generally to regulate transportation. In no other equally large area in the civilized world is trade unrestricted by customs, excises, or national prejudice. The freedom which the United States enjoys from tradition is another factor of prime importance.

At the same time the manufacturing industry has profited by reason of the contribution of ideas of people schooled under different industrial systems. The immigrant, like the native born, is animated by the prospects of large possibilities, and greater energy and ingenuity pervade industrial society in the United States than are known in the European countries. As a result the individual laborer usually accomplishes more in the United States than he does in Europe.

Mulhall, the statistician, once said that nearly all American manufactures were produced by machinery, while in Europe more than one-half were hand work. This statement as regards Europe hardly would hold true to-day, but in many industries as regards the completeness of organization, the minuteness of subdivision, and the rapidity with which work is expedited, the United States excels. This is particularly the case with the newer industries, such as electrical machinery and motor vehicles. The United States early developed a system of interchangeable mechanism, followed later by various schemes of industrial efficiency, which have proved of inestimable value to the progress of the manufacturing industry.

Localization. The manufacturing industry is very unevenly distributed over the country. There is a decided tendency to centralize in limited localities. The greater part of the manufacturing is carried on in the region north of the Potomac and Ohio rivers and east of the Mississippi. The centre of manufactures has always been well to the north and east of the centre of population, but has at every decade moved westward and was nearer the centre of population in 1910 than in 1850.

On the basis of division in the census of manufactures in 1909 the percentage of distribution was as follows: New England, 12.9 per cent; Middle Atlantic States, 34.5; East North Central, 26.2; West North Central, 8.7; East South Central, 3.0; West South Central, 3.0; South Atlantic, 6.7; Mountain, 1.8; Pacific, 4.1.

In the localization of industries the factor of transportation in its relation to the supply of raw materials and the market has been one of primary importance. This applies especially to bulky and heavy products which are shipped with difficulty. Thus Pennsylvania, eastern Ohio, and Illinois have become the iron-manufacturing region, since coal and iron are brought together here at a minimum cost. Live animals cannot be so easily shipped as packed meats, and hence the slaughtering and meat-packing industry is confined mainly to the West. The saving in the cost of transportation is a chief reason for the development of cotton manufacturing in the cotton-growing region. Proximity to the supply of wood and iron and convenience to the market give the Lake States the advantage of manufacturing agricultural implements at a minimum transportation cost, though in 1909 New York ranked second to Illinois in this field, while Ohio was third. The densely populated Atlantic Coast region from Baltimore to Maine enables manufactures located in that section to reach a large market, including convenient export ports, with a minimum transportation cost.

Another important natural condition affecting localization of industries is water power. This was formerly an important consideration and was more prominent in determining the exact spot than the general section. Often, however, the natural advantages mentioned were of secondary importance, and this consideration declined in relative importance after an industry was well established.

Latterly, with hydroelectric developments, location adjacent to a cheap and reliable source of water power again has become an important consideration, though by means of long-distance transmission lines electrical energy can be delivered at convenient locations within a certain radius. Electrochemical industries in particular have been located with this consideration in view, and it has been estimated that there are some 37,000,000 horse power available for water power in the United States. Much of this water power has been governed in its use by Federal restrictions and reservations, but will be developed with more liberal legislation.

In many industries technical training and labor supply are of greater importance than accessibility to raw materials, and efficient organization and scientific control are being developed by the more important manufacturing corporations. Abundance of capital and labor are other prominent advantages that may vary with economic conditions, but are usually available for the American manufacturer. For the growth and extent of manufactures, see MANUFACTURES, and the separate articles on the various manufacturing industries, such as COTTON; FLOUR; IRON AND STEEL, METALLURGY OF; ETC. Also see the paragraph on *Manufactures* under the various States.

Textiles. The group of industries called textiles in 1909 ranked first in the number of wage earners employed and third in the value of products. The following table shows for 1909 the product of each of the chief elements of textile manufacture.

Cotton	$628,391,813
Wool	507,166,710
Silk	196,911,667
Hosiery and knit goods	200,143,527
Cordage, twine, jute and linen	61,019,966
Shoddy	7,446,364
Dyeing and finishing textiles	83,556,432

The cotton-manufacturing industry has developed in recent years with great rapidity and has placed the United States first with respect to the number of bales of cotton consumed.

In 1915 the number of cotton spindles in the United States was estimated at 31,467,345, out of a total for the world of 141,500,000. The wool consumption for 1909 in the United States was 488,368,690 pounds, of which 320,298,916 pounds were domestic and 168,069,774 were foreign. In 1915 the amount of foreign wool imported had reached nearly 240,000,000 pounds.

The value of the products of woolen goods in 1909 was $107,118,858. In that year there were 52,180 wage earners employed in 587 establishments. The manufacture of worsteds dates back to 1843, but in 1909 the value of these products exceeded that of the older industry. This amounted to $312,624,663, the persons engaged in the industry numbering 111,012. The hosiery and knit-goods industry is also of comparatively recent development. From a product valued at $1,028,102 in 1850 it grew until it amounted to $200,143,527 in 1909. In that year the United States led in the value of silk manufactured, which amounted to $196,911,667. Almost the entire supply is imported from Japan, China, and Italy. The industries of cordage, twine, jute, and linen manufacture had products valued at $61,019,986 in 1909. There were 25,820 wage earners employed in 164 establishments. Binder twine (value, in 1909, $14,079,071) and rope (value, in 1909, $19,850,635) together constitute over one-half of the total product. See FLAX; JUTE; KNITTING; SILK; TEXTILE MANUFACTURING; WOOL AND WORSTED MANUFACTURES.

Clothing. The production of men's ready-made or factory-made clothing was already well advanced by 1850, but the manufacture of women's ready-made clothing has developed almost wholly since then. The total value of men's clothing (factory product) in 1909 was $485,677,493, an increase of 75 per cent since 1899, when it amounted to $276,717,357. In 1889 it was $251,019,609; in 1879 it was $209,548,460; in 1869, $61,865,547; and in 1859 $80,830,555. The value of women's factory-made clothing meanwhile increased from $159,339,539, in 1899, to $384,751,649, in 1909, or 242 per cent. In 1889 the output of this industry was valued at $68,164,019, in 1879 at $32,004,794, in 1869 at $12,900,583, and in 1859 at $7,181,039. There are few other important branches of industry that employ so many wage earners in proportion to the value of the product. In 1909 there were 191,183 engaged in the manufacture of men's clothing and 153,743 in that of women's clothing. After about 1876 a revolution in the system of manufacturing men's clothing, resulting from the greater division of labor and the use of machinery, brought about a decrease of nearly one-fourth in the number of wage earners, but this was made good after 1900 by the natural increase in the industry.

In 1909, out of 5584 establishments devoted to the manufacture of men's clothing, 3217, with a product valued at $45,817,234, were contract shops, as compared with 2367 regular factories, with a product valued at $439,860,259. More skill is required in the manufacture of women's clothing, and the task system has not been applied much in cloak manufacture. In 1909 almost one-half of the total product of men's ready-made clothing and over two-thirds of women's ready-made clothing were made in New York City. The business formerly done in Massachusetts has been largely transferred to New York; while Illinois, Pennsylvania, and Maryland follow in the order named. Other important items of clothing manufacture for the year 1909 were: shirts, $82,399,142; men's furnishing goods, $87,710,197; hats and caps, other than straw and fur felt, $13,689,338.

Iron and Steel. The United States is abundantly provided by nature with resources that are necessary for the production of iron and its manufacture. (See IRON.) No other industry compares with it in the absolute growth made since 1880. In 1890 the United States led the world in the production of pig iron and steel, and in 1905 its production of pig iron was more than double that of Great Britain and its production of steel was more than three times as great as that of the rival country. In 1913 the United States produced 30,966,152 long tons of pig iron. In 1914 the output of pig iron for the United States was 23,269,067 long tons, valued at $312,639,706, and other products valued at $4,919,347, the output of 160 establishments with 284 active blast-furnace stacks. The census year 1914 was one of industrial depression, and the output was greatly exceeded in 1915, when the United States produced 29,916,213 tons. The production of pig iron by grades in the years 1910, 1913, and 1915 is given in the accompanying table.

PRODUCTION OF PIG IRON BY GRADES

1910–15, gross tons

GRADES	1910	1913	1915
Basic	9,084,608	12,536,693	13,093,214
Bessemer	11,245,642	11,590,113	10,523,306
Foundry	5,260,447	5,220,343	4,864,348
Malleable	843,123	993,736	829,921
Forge	564,157	324,407	316,214
All other	305,590	300,860	289,210
Total	27,303,567	30,966,152	29,916,213

In 1913 the steel output of the United States amounted to 31,300,874 long tons. In 1915 the United States was attaining close to a production of 40,000,000 tons per annum.

The following are statistics for blast furnaces from the time of their being reported first in 1849 to the thirteenth census in 1909:

YEAR	Number of establishments	Wage earners Average number	Wages	Cost of material	Value of product	Value added by manufacture
1909	208	38,429	$24,606,530	$320,637,889	$391,429,283	$70,791,394
1899	223	39,241	18,484,400	131,503,655	206,756,557	75,252,902
1889	304	33,415	14,614,458	110,098,615	145,643,153	35,544,538
1879	341	41,695	12,655,428	58,619,742	89,315,569	30,695,827
1869	386	27,554	12,475,250	45,498,017	69,640,498	24,142,481
1859	286	15,927	4,545,430	12,293,030	20,870,120	8,577,090
1849	404	21,054	5,011,300	7,538,118	13,491,898	5,953,780

The production of Bessemer and low phosphorous pig iron reached a maximum of 13,840,518 long tons in 1906, falling to 10,523,306 in 1915, while that produced by the basic open-hearth method amounted to 12,537,746 tons. The value of steel rails manufactured increased from $37,892,075 in 1880 to $60,272,575 in 1890, and to $81,128,295 in 1909, the tonnage in that year being 2,858,599. The value of iron and steel bars and rods, not including sheet or tin plate bars or wire rods, increased from $56,696,679 in 1880 to $121,488,423 in 1909. Other large items of manufacture in 1909 were iron and steel wire rods, $61,947,958; iron and steel hoops, bands, cotton ties, $10,429,681, and skelp, flue, and pipe, $64,514,728; iron and steel boilers and other plates and sheets, except nail and tack plate, back plates or sheet for tinning and armor plate, $133,272,393; iron and steel roll blooms, slabs, billets, tin-plate bars, and sheet bars, $153,493,360. See IRON AND STEEL, METALLURGY OF.

Shipbuilding. Shipbuilding was, after agriculture, the first industry to develop in Colonial

America. The possession of an abundance of timber has always given the United States a great advantage in the building of wooden vessels. Vessels constructed in the United States carried the bulk of the American trade until after 1860. After the Civil War for many years American shipyards did little more than supply vessels for the large domestic water-borne trade, which has by law been restricted to vessels built in the United States, but changes in conditions due to the European War led to increased activity in 1915 when ship manufacturers were well supplied with orders and looked for continued prosperity. The figures for the construction of iron and steel vessels have been greatly swollen in recent years in meeting the requirements of the Navy Department. While ships for the navy have been and are built at the large navy yards, the greater part of the orders for warships have been placed with domestic firms, in the belief that it would lead to the equipment of plants in a way that would enable them successfully to engage in the construction of large steel merchant vessels. Much of the total tonnage built in the United States is constructed on the Great Lakes, where as many as 50 vessels with a gross tonnage of 253,949 have been under construction at one time. This was a maximum for 1907. In 1915 the number (14 vessels, with a tonnage of 15,951) was far below the Great Lakes average. The Delaware River district, with its yards at Philadelphia, Pa., and Camden, N. J., often leads in the output, but modern shipbuilding plants, at Newport News, Va., Sparrows Point, Md., Quincy, Mass., and San Francisco, Cal., all help to swell the total in seacoast shipbuilding industry. The Chesapeake Bay is also important. See SHIP AND SHIPPING; SHIPBUILDING.

VESSELS OF 1000 GROSS TONS AND OVER BUILT IN THE UNITED STATES, 1911-15

TYPE	1911		1914		1915	
	No.	Gr. tons	No.	Gr. tons	No.	Gr. tons
Seaboard:						
Ocean steel steamers	18	76,490	29	133,234	18	111,625
Steel ferryboats, steam dredges, river and bay steamers	8	14,463			1	1,402
Wooden steamers	3	3,320	1	1,008	1	5,373
Wooden schooners	1	1,352	4	6462	1	1,318
Steel schooners	1	1,290				
Steel unrigged vessels	1	1,133	1	1,505		
Total	32	98,048	35	142,209	21	119,718
Great Lakes:						
Steel steamers, for Lake trade	14	71,276	8	37,780	1	6,331
Steel unrigged vessels						
Steel steamers, Ocean trade			3	7,459	1	1,815
Steel schooner barges, ocean trade						
Total	14	71,276	11	45,239	2	8,146
Grand total	46	169,324	46	187,448	23	127,864

Automobiles. In 1900 the manufacture of these vehicles was conducted in 57 establishments, employing 2241 people, with a production of $4,748,000. In 1905 there were 121 establishments, employing over 10,000 workmen, with a product valued at $26,645,064. In 1915 an unofficial estimate showed a production of 892,618 motor vehicles valued at $691,778,950 produced by 448 manufacturers; and for 1916 a production in excess of 1,000,000 cars. The average price for a passenger car in 1915 was $672, as compared with $1113 in 1907. In 1915 the exports of automobiles manufactured in the United States exceeded $111,000,000. The manufacture of motor vehicles has become very important, and, in addition to the normal demand for home consumption with its regular increase, there were manufactured for the belligerent armies during the European War a vast number of motor trucks and other motor vehicles.

Alcoholic and Malt Liquors. The production of liquors in the United States is in excess of the home consumption, and some wine and a small amount of distilled liquors are imported. In 1909 the value of malt liquors produced was reported at $374,730,096, distilled liquors at $204,699,412, and vinous liquors at $13,120,846. The manufacture of wine is relatively small and is confined to the grape-growing regions. The total number of establishments producing liquors of all kinds in 1909 was 2027, and the total workers employed, 61,009. See LIQUORS.

Slaughtering and Meat Packing. In 1850 slaughtering and meat packing was of little importance as a specialized industry, the value of the product for that year being only $11,981,642. Before 1890, however, the industry had become the most important of the industries manufacturing food products, and in 1909 was far in the lead with a total value of products of $1,370,568,101. There was a proportional increase of the capital invested, which amounted to $383,249,170.

The number of wage earners employed in the industry in 1909 totaled 89,728. Of the 1641 establishments reported in 1909, 656 (40 per cent) were engaged primarily in slaughtering and packing, and these employed 90.7 per cent of the total number of wage earners, and their output was valued at $1,204,248,578, or 87.9 per cent of the total for the industry. Of the 656 establishments, 159 did no slaughtering, but were engaged exclusively in packing meat, while of the 565 engaged chiefly in slaughtering, 31 were abattoirs, in which animals were slaughtered for others, including both wholesale and retail trade. See PACKING INDUSTRY.

In addition to the above see CARRIAGE; BICYCLE; MOTOR CYCLE; IMPLEMENTS, AGRICULTURAL; PAPER; LUMBER INDUSTRY; GLASS; LEATHER; SHOES; ETC.

TRANSPORTATION

Railways. The great industrial progress that began soon after 1850 was made possible largely by railways. The construction of railways in the United States began towards the close of the decade 1820–30. Their introduction had been preceded by the inauguration of a vast system of canals, the Erie Canal, which was to remain long the principal artery of transportation between the East and West, having been opened in 1825. The growth of the railway system was extremely rapid from the beginning. The mileage increased from 23 in 1830 to 2818 in 1840 and 9021 in 1850. Over much of the country railways preceded industries, and certain industrial developments, such as those of iron and coal and of agriculture in the West, could not have taken place on any great scale without railway advantages. The growth of American railways, in which it is estimated from one-seventh to one-fifth of the country's capital is now invested, is shown in the following table (mileage).

The figures previous to 1890 have been taken from Poor's Manual, but have been combined to approximate the groupings of the Interstate Commerce Commission as given in their annual report of 1914. The divisions correspond to the three great freight classification territories and are as follows: the Eastern District, comprising that portion bounded on the west by the north and west shore of Lake Michigan to Chicago, thence by a broken line whose corners are Peoria and East St. Louis, and down the Mississippi to the mouth of the Ohio River; on the south by the Ohio River to Parkersburg, W. Va., thence by a line to the southwest corner of Maryland and down the Potomac to its mouth. The Southern District is bounded on the north by the Eastern District and on the west by the Mississippi; the remainder of the country exclusive of the noncontiguous territory comprises the Western District.

DISTRICT	1850	1860	1870	1880	1890	1900	1910	1914
Eastern	6,888	19,596	29,772	46,233	47,210	43,506	56,310	61,184
Southern	2,133	9,190	11,587	15,469	27,667	34,566	44,003	51,099
Western	.....	1,840	11,563	31,560	88,719	106,275	140,126	139,948
Total United States	9,021	30,626	52,922	93,262	163,597	193,346	240,438	252,231

The rate of growth has fluctuated greatly. Checked by the Civil War, the mileage nearly doubled between 1865 and 1873. From the latter year to 1879 construction was reduced, but it then revived and, with a short interruption in 1884–85, advanced rapidly until 1893 and again continued after 1898. The year 1887 exceeded all others, with 12,876 miles. Prior to 1850 construction was mainly in the Atlantic Coast States, but in 1850–60 noteworthy gains were made in the North Central States and in the South. In 1852 rail connection was established between Chicago and the Atlantic coast and in 1869 between the Atlantic and Pacific coasts. In 1870–80 there were important gains in the upper Mississippi valley and in eastern Texas, which was the first southern State to show activity in railway construction after the war. In 1880–90 the Southern States doubled their mileage. Since 1895 (in which year there was the least construction after the Civil War, 1650 miles) the most rapid progress has been between the Gulf of Mexico and the Kansas and Missouri rivers. The greatest railway density is in the region north of the Ohio and Potomac rivers. New Jersey leads with 30 miles of line for each 100 square miles of area.

Among the factors that hastened railway development were the business rivalry between cities or sections, subsidies in one form or another, and the small cost of right of way. State grants in aid (many of them land grants) were common until 1861, when the Federal government began to make land grants directly to the companies. The first line reaching the Pacific received grants of 33,000,000 acres in addition to a large loan based upon mileage and difficulty of construction. The total congressional land grants between 1850 and 1871 amounted to 155,000,000 acres, but of these only 97,976,637 acres were patented up to 1902.

In general American railways have been constructed more cheaply than British or western European, but improvements have been made as warranted by traffic. Thus there is great inequality in the condition of American roads.

The tendency towards railway consolidation appeared soon after 1850. Keen competition did not come until after the Civil War, notably in 1869, when the Pennsylvania Railroad and the New York Central made their connections with Chicago. The development of the parallel lines, or two or more railways connecting the same points, so intensified competition that the companies were forced to seek among themselves some relief. Thus arose, between 1870 and 1880, the pools, or agreements between companies in regard to the distribution of traffic or the benefits of traffic. The prohibition of pools by the Interstate Commerce Act of 1887 renewed competition, to escape which the railway companies came to secret understandings, and traffic associations were formed to fix a fair proportion of the traffic for each railroad involved. In 1897 this form of coöperation was declared illegal by the United States Supreme Court. Thereafter agreements between companies as to rates and the distribution of traffic benefits were more informal, but, according to the Interstate Commerce Commission, the court decisions have had "no practical effect upon the railway operations of the country," while, in respect to the organization of railways, the inconveniences in the way of mutual understandings accelerated consolidation, notably after 1898. Thus in 1902 more than two-thirds of the total mileage of the United States was included in eight groups of railway interests.

Systems.—There were 252,231 miles of railway in the United States, or an average of 25.64 miles of railway to each 10,000 inhabitants in 1914. The history of the building of these railways covers a period beginning in 1826. As in other countries, the railway system of the United States may be compared to a net, but the main routes for freight and passengers can be briefly summarized as follows: (1) the lines radiating from New York and connecting that city with Boston and the rest of New England on the north, Chicago on the west, and the South Atlantic seaports on the south; (2) the roads running from the various Missouri River crossings to the Mississippi River crossings; (3) the roads running north and south from Chicago, serving the Mississippi valley; (4) the transcontinental railroads, so called, running from the Mississippi River crossings to the Pacific coast.

The main routes, connecting New York and Chicago, are the New York Central Railroad, which runs north from New York, following the Hudson River to Albany, where it turns west, following the Mohawk valley, and then the shores of Lake Erie to Buffalo, and from there continuing west to the south end of Lake Michigan; the Pennsylvania Railroad, which runs 90 miles south from New York to Philadelphia, there turns west crossing the Alleghanies to Pittsburgh, running from there slightly north of west to Chicago; and the Erie Railroad, which runs about west from New York to Chicago, but which is a little longer than either of the other two routes because of the number of curves necessitated by the mountainous character of the country traversed.

Chicago is the greatest railway centre in the country. It is the western terminus of the three great eastern roads which run out of New York, the northern terminus of the Illinois Central, which runs down the Mississippi valley to New Orleans, the southeastern terminus of the systems reaching the great northwestern wheat and grain country. These roads include the Chicago, Milwaukee, and St. Paul, the Chicago and Northwestern, and the Chicago, Burlington, and Quincy. It is the eastern terminus of the Atchison, Topeka, and Santa Fe, the Chicago, Rock Island, and Pacific, and through it passes the traffic which the Chicago and Northwestern Railway delivers to the Union Pacific at Omaha, Neb.

The twin cities of Minneapolis and St. Paul are the railway centre of the northwestern roads, which include, besides the Chicago, Milwaukee, and St. Paul previously mentioned, the Northern Pacific and the Great Northern. South of Chicago the two great railway centres are St. Louis, at the juncture of the Mississippi and the Missouri rivers, and Kansas City, on the Missouri River. Kansas City is the northern gateway for the roads which spread out over the States of Kansas, Oklahoma, and Texas, and which include the Chicago, Rock Island, and Pacific, the Missouri, Kansas, and Texas, and the Kansas City Southern. Still farther south New Orleans is the southernmost Mississippi crossing; the southern terminus of the Illinois Central; the southeastern terminus of the Southern Railway system, which spreads like a net over the Southeastern States; and the eastern terminus of the Southern Pacific, which skirts along the southern boundary of the United States from the Mississippi River to the Pacific Ocean.

Notwithstanding the fact that all these cities except Kansas City are situated on important waterways, their railroad facilities have had the greater influence in their commercial development. The cities west of the Mississippi, as far as California, have been entirely dependent on the railroads, and the development of California has been shaped to a far greater extent by north and south railway lines in that State than by the coastwise steamship lines.

The following is a brief description of the principal railway systems of the United States, with their affiliated and subsidiary lines:

The Pennsylvania Railroad system runs from Philadelphia via Pittsburgh to Chicago, and from Pittsburgh to St. Louis, and from Philadelphia north to New York, and from Philadelphia south to Washington. Nearly half of the total tonnage of freight of that part of the system lying between Philadelphia and Pittsburgh is coal, and a considerable percentage of the remainder is products of the steel mills at Pittsburgh. Financing for the road has been done principally by Kuhn, Loeb & Co.

The New York Central lines run from New York via Albany to Buffalo and Chicago, and from Cleveland to Cincinnati and St. Louis, with a line from Buffalo to Pittsburgh. A considerably smaller proportion of its freight tonnage consists of coal, and a much larger proportion of merchandise and manufactured products. It has been financed by J. P. Morgan & Co. exclusively in the last 20 years and is controlled by the Vanderbilt family.

The Southern Railway runs south from Washington and spreads like a net over the Southeastern States; its financing has been done in the last 20 years by J. P. Morgan & Co., and this firm of bankers has dictated its general policies.

The New York, New Haven, and Hartford forms a network over the New England States as far north as Boston and is supplemented north of Boston by the Boston and Maine, which it at one time controlled; its financing has been done by J. P. Morgan & Co.

The Great Northern runs from St. Paul along the northern border of the United States to Spokane, Portland, and Seattle; lumber and agricultural products of California form its east-bound freight traffic, moving over the entire line. It also has a very large business furnished by grain in the Northwestern States, and a large tonnage of ore moving from the Misabe Range to Duluth, Mich. It was controlled by James J. Hill, and its financing has been done by J. P. Morgan & Co.

The Northern Pacific runs from St. Paul through the Dakotas and Montana to Portland and to the cities of northern California; it was controlled by James J. Hill and is financed by J. P. Morgan & Co.

The Chicago, Milwaukee, and St. Paul runs from Chicago via Minneapolis and St. Paul, through the Dakotas and Montana to Portland and Seattle; the Rockefellers have a controlling interest in the company, and its financing has been done by various banking houses.

The Chicago, Burlington, and Quincy runs from Chicago west to Denver and northwest to Billings, Mont., where it connects with the Northern Pacific; it has also a line running south from Denver to Houston, Tex. It is controlled by the Great Northern and Northern Pacific jointly, and its financing has been done by J. P. Morgan & Co.

The Union Pacific runs west from Omaha to Salt Lake City, where it connects with the Southern Pacific, which extends west to San Francisco and northwest from Denver into northern California, Oregon, and Washington; it is controlled by the estate of E. H. Harriman, and its financing has been done by Kuhn, Loeb & Co.

The Atchison, Topeka, and Santa Fe runs from Chicago west to Denver and southwest through Arizona to California; it has lines running the length of California north and south. No one interest controls the Atchison, Topeka, and Santa Fe, and its financing has been done by various banking houses.

The Southern Pacific runs from New Orleans through Texas to Los Angeles and up the Pacific coast to Washington, and from Salt Lake City to San Francisco; the system was built up by Collis P. Huntington and was sold to the Union Pacific in 1901. In 1913 the United States Supreme Court ordered the sale of the controlling interest in the Southern Pacific stock by the Union Pacific; its financing has been done by Kuhn, Loeb & Co.

The Chicago, Rock Island, and Pacific runs from Chicago southwest through Kansas and Oklahoma into Texas, west from Chicago to Denver, and north from Chicago into Wisconsin and Minnesota. Control was acquired in 1902 by D. G. Reid, W. B. Leeds, and W. H. Moore; its financing has been done largely by Speyer & Co.

The St. Louis and San Francisco runs from St. Louis south to Birmingham, Ala., and southwest through Kansas, Oklahoma, and Texas. Until the road went into the hands of receivers, in 1913, it was controlled by B. F. Yoakum and associates; the financing was done by Speyer & Co. and various other bankers.

The Illinois Central runs from Chicago south to New Orleans; it was built up largely by Stuyvesant Fish, and control was obtained against the opposition of Mr. Fish by the late E. H. Harriman in 1906 and 1907.

The Louisville and Nashville, the Nashville, Chattanooga, and St. Louis, and the Atlantic Coast Line are under the same control and form a system running southeast from St. Louis, forming a network over the Southeastern States competitive with the Southern Railway. Control is held by W. H. Walters, and the financing has been done by J. P. Morgan & Co. and other bankers.

The Wabash, the Missouri Pacific, the Denver and Rio Grande, and the Western Pacific form a system running from Buffalo, N. Y., to San Francisco, Cal. All of these companies were formerly controlled by the Gould family, but the Wabash and the Missouri Pacific went into the hands of receivers and in 1915 were being financed and controlled by Kuhn, Loeb & Co. See CANAL; EXPRESS COMPANY; INTERSTATE COMMERCE ACT; POST OFFICE; RAILWAYS; STEAM NAVIGATION; STREET RAILWAYS; TELEGRAPH; TELEPHONE; TRANSPORTATION.

COMMERCE

Foreign Commerce. *Early Development.*—The foreign commerce of the United States has passed through those various stages which usually accompany the transition of a country where manufacturing succeeds agriculture as the predominating industry. The section of the United States first developed was densely forested and had also certain mineral deposits available. This was the section lying east of the Alleghany and Cumberland mountains. When the section west of those mountains was developed, it was found especially fitted for the production of live stock, wheat, corn, and other cereals; at the south cotton, and at the extreme north copper and iron. With the extension of railways to the west of the Mississippi the grain and live-stock area gradually enlarged, the mineral products were materially increased, and the population able to contribute to foreign commerce rapidly developed, partly by immigration from abroad and partly by movement from the Atlantic seaboard. With the occupancy of the Pacific coast the large production of gold increased the power to purchase imports and developed industries which contributed to the export trade, while the wheat and fruits of that section found ready markets abroad. Meantime the development of great coal beds in the eastern and central sections of the country had, in conjunction with the domestic cotton, wool, iron, and copper, developed a great manufacturing industry, which was strengthened by labor supplied by the heavy immigration from the European countries. These industries supplying the exports in turn demanded the products of other countries—some of them for the consumption of the people engaged in production, some of them for use in manufacturing.

Thus every stage of the development of the country contributed to commerce, and this development extended to every line of production, forestry, agriculture, mining, and manufactures. The outside world came to recognize the United States as a source of supply for lumber, cotton, copper, wheat, corn, meats, and finally manufactures; and the United States came to recognize certain sections of the outside world as the source which could supply the food stuffs and manufacturing materials required by its busy and prosperous population.

The growth in commerce has therefore been steady and consistent with the development of producing and consuming powers of a great fertile country enlarged from time to time by great additions of territory and an increase to its population of over 30,000,000 immigrants. True there have been certain occasions in which the growth in exports was temporarily disturbed, having been checked by the embargo which accompanied the war with Great Britain in 1812–14 and again stimulated by a large importation of merchandise for reëxportation during the period of the Napoleonic wars, but they were but mere incidents produced by temporary causes and disappeared with their termination.

The commerce of the Colonies prior to the Declaration of Independence was largely with Great Britain. This was quite natural, both in view of the fact that the people were of British birth or parentage and thus accustomed to the products of that country and that England systematically encouraged, by legislation and otherwise, a reliance upon the mother country for every class of merchandise which it could supply. Gradually, however, there grew up the custom of drawing upon other countries of Europe, especially for wines and fruits and for coffee, tea, spices, and silks, which they had drawn from the Orient, while sugar, molasses, and rum were obtained from the West Indies.

The foreign commerce of the 13 Colonies in 1769 is stated by Macpherson, *Annals of Commerce*, in the following table, which, not complete, closely approximates the total trade in that year.

COMMERCE OF THE THIRTEEN COLONIES IN 1769

	Imports from	Exports to
Great Britain	£1,604,973	£1,531,516
West Indies	789,754	747,910
Africa	151,998	20,278
South of Europe	76,684	552,736
	£2,623,412	£2,852,441

Then followed the War of the Revolution, in which commerce with England was practically suspended and that with other countries greatly interrupted. Owing to the loose commercial organization of the Colonies during this period and immediately after the war no satisfactory record of the commerce is available. The total value of the merchandise exported from the United States in the first year under the Constitution, from

August, 1789, to September, 1790, is $20,205,156, of which about $9,000,000 was sent to Great Britain, approximately $4,000,000 to the West Indies, $2,000,000 to Spain and its colonies, $2,000,000 to the Netherlands and its colonies, and over $1,000,000 to Portugal and its colonies. The imports were $25,000,000, of which about one-half came from Great Britain, one-fourth from Spain and her colonies, and most of the remainder from other European countries and their colonies. The chief exports in the beginning were wheat, corn, tobacco, meats, pot and pearl ash, resin, turpentines, tar, and pitch. The chief imports were clothing, wines, sugar, coffee, and miscellaneous merchandise. By 1800 imports had grown to $91,000,000 and the exports to $72,000,000, but over one-half of the exports was merchandise from the West Indies and other countries reëxported to Europe, the domestic exports of the year 1800 amounting to only $32,000,000. This large influx of foreign goods for reëxportation was but temporary, and by the year 1820 foreign merchandise formed but 25 per cent of the total exports, 10 per cent in 1840, 5 per cent in 1860, about 4 per cent in 1870, and in more recent years less than 2 per cent of the total merchandise exported. The table which follows shows the total foreign trade of the United States at 10-year intervals from 1790 to the latest date available, the figures being for fiscal years.

FOREIGN COMMERCE OF THE UNITED STATES AT DECENNIAL YEARS 1790–1915

FISCAL YEARS	IMPORTS				EXPORTS			
	Free	Dutiable	Total	Per capita	Domestic	Foreign	Total	Per capita
1790	....	....	$20,000,000	$6.51	....	....	$26,481,000	$8.66
1800	....	....	91,253,000	17.19	$31,840,000	$39,131,000	70,972,000	13.37
1810	....	....	85,400,000	11.80	42,367,000	24,791,000	66,758,000	9.22
1820	....	....	74,450,000	7.71	51,684,000	18,008,000	69,692,000	7.22
1830	$4,590,000	$58,131,000	62,721,000	4.87	58,524,000	13,145,000	71,070,000	5.57
1840	48,313,000	49,945,000	98,259,000	5.76	111,661,000	12,008,000	123,669,000	7.25
1850	18,082,000	155,428,000	173,510,000	7.48	134,900,000	9,475,000	144,376,000	6.23
1860	73,741,000	279,875,000	353,616,000	11.25	316,242,000	17,334,000	333,576,000	10.61
1870	20,141,000	415,818,000	435,958,000	11.06	376,616,000	16,155,000	392,772,000	9.77
1880	208,302,000	459,653,000	667,955,000	12.51	823,946,000	11,692,000	835,639,000	16.43
1890	265,669,000	523,642,000	789,310,000	12.16	845,294,000	12,535,000	857,829,000	13.43
1900	367,237,000	482,704,000	849,941,000	10.93	1,370,764,000	23,720,000	1,394,483,000	17.76
1910	755,311,000	801,636,000	1,556,947,000	16.54	1,710,084,000	34,901,000	1,744,985,000	18.28
1914	1,127,503,000	766,423,000	1,893,926,000	19.04	2,329,684,000	34,895,000	2,364,579,000	23.27
*1915	1,033,526,000	640,643,000	1,674,170,000	16.32	2,716,178,000	52,410,000	2,768,589,000	27.16

* Figures for this year are abnormal because of the European War.

It is not until 1821, however, that we get a clear view of the real trade condition of the United States. Prior to that time, by reason of the war complications abroad, much foreign merchandise from the West Indies and elsewhere was sent to the United States for reëxportation, much of this merchandise merely passing from one vessel to another. The further fact that the official statement of imports and exports prior to 1821 did not state the values of the various articles forming the trade in sufficient detail renders impossible any close analysis of the trade prior to 1821. Beginning with that date, however, the imports and exports by greater groups of articles are as stated in the tables herewith.

Modern Conditions.—The tables give an opportunity to study the growth in the national trade and the changes in its character. Especially suggestive in determining the changes in the character of the trade are the figures which show the percentage which each group of products forms of the total value of the trade. The value of the domestic manufactures produced has grown from $1,000,000,000 in 1850, the earliest census of manufactures, to over $20,000,000,000 in 1910, and for these purposes much material was required from other countries. The raw material imported for manufacturing includes fibres, silk, Egyptian cotton, and India rubber. The partly manufactured material includes such articles as tin, copper, wood pulp, and timber. The crude foodstuffs imported include coffee, tea, cocoa, fruits, and rice, while those classed as part or whole manufactures include sugar, canned and dried or salted fish, dried fruits, and other articles of this character. On the export side the raw materials for manufacturing are chiefly cotton and lumber. Those classified as crude foodstuffs are chiefly wheat, oats, corn, and other cereals; those classified as part or whole manufactures are flour, meats, dried and preserved fruits, canned fish, breakfast foods, dairy products, etc. The manufactures exported under the classification of manufactures for further use in manufacturing include pig copper, pig and bar iron, structural materials, leather, lumber, and builders' hardware. The manufactures exported in condition ready for use include agricultural machinery, cars, carriages, automobiles, boots and shoes, clothing, cotton and wool manufactures, iron and steel manufactures, refined mineral oils, and many other articles of a miscellaneous character. The group entitled miscellaneous includes animals, except those for food, seeds, trees, plants, etc. The very large increase of this group in 1915 is due to the exportation of a large number of horses and mules to Europe for war purposes.

From the table it will be readily seen that the share which manufacturing materials form of the imports is increasing, that the share which finished manufactures form of the total imports is declining, and that foodstuffs, while increasing in the total, show no marked change in the share which they form of the grand total. On the export side manufacturing material, which is chiefly cotton, shows a large increase in exports and a slight increase in the share of the total, foodstuffs show a slight decline in value of exports and a marked decline in the share which they form of the total, and manufactures show a marked increase both in the total value and in the share which they form of the grand total of exports. It is thus apparent that the hope for further growth in the exports of the United States lies chiefly in manufactures. The large population requires the bulk of the foodstuffs and a growing share of the manufacturing material, while manufactures are increasing more rapidly than domestic requirements.

IMPORTS AND DOMESTIC EXPORTS OF THE UNITED STATES IN DECENNIAL YEARS AND THE SHARE WHICH EACH GROUP FORMED OF THE TOTAL, 1821–1915

FISCAL YEAR	Crude material for manufacturing	Per cent of total	Foodstuffs crude	Per cent of total	Foodstuffs manufactured	Per cent of total	Manufactures for manufacturing	Per cent of total	Manufactures ready for use	Per cent of total	Miscellaneous	Per cent of total	Total
IMPORTS													
1821	$1,983,706	3.64	$6,081,641	11.15	$10,820,814	19.85	$4,079,064	7.48	$30,998,900	56.86	$556,719	1.02	$54,520,834
1830	4,214,825	6.72	7,382,274	11.77	9,653,971	15.39	5,152,486	8.22	35,734,837	56.97	582,563	0.93	62,720,956
1840	11,510,245	11.71	15,273,321	15.54	15,188,845	15.46	11,359,196	11.56	44,300,005	45.09	630,094	0.64	98,258,706
1850	11,711,266	6.75	18,011,659	10.38	21,465,776	12.37	26,163,152	15.08	95,312,499	54.93	845,174	0.49	173,509,526
1860	39,691,797	11.22	45,743,826	12.94	59,837,674	16.92	34,899,303	9.87	172,128,991	48.68	1,314,528	0.37	353,616,119
1870	55,615,202	12.76	54,081,091	12.41	96,081,635	22.03	55,569,071	12.75	173,614,888	39.82	996,512	0.23	435,958,408
1880	131,861,617	19.74	100,297,040	15.01	118,125,216	17.69	110,779,516	16.59	196,587,405	29.43	10,303,952	1.54	667,954,746
1890	170,637,250	21.62	128,480,142	16.28	133,332,031	16.89	116,924,080	14.81	230,685,581	29.23	9,251,325	1.17	789,310,409
1900	276,241,152	32.50	97,916,293	11.52	133,027,374	15.65	134,222,045	15.79	203,126,341	23.90	5,407,979	0.64	849,941,184
1910	566,270,770	36.37	144,776,636	9.30	181,566,572	11.66	285,138,373	18.31	376,723,367	23.62	11,471,712	0.74	1,556,947,430
1914	632,865,860	33.42	247,947,621	13.09	227,644,329	12.02	319,275,488	16.86	449,318,214	23.72	16,874,145	0.89	1,893,925,657
*1915	575,357,144	34.38	223,929,564	13.38	285,725,091	17.07	237,176,522	14.17	335,876,628	20.04	16,104,791	0.96	1,674,169,740
DOMESTIC EXPORTS													
1821	31,246,382	60.46	2,474,822	4.79	10,085,366	19.51	4,867,379	9.42	2,925,165	5.66	84,526	0.16	51,863,640
1830	36,482,266	62.34	2,724,181	4.65	9,556,992	16.32	4,117,606	7.04	5,461,589	9.34	182,244	0.30	58,524,578
1840	75,488,421	67.61	4,564,532	4.09	15,936,108	14.27	4,841,101	4.34	10,584,079	9.47	246,320	0.22	111,660,561
1850	83,984,707	62.26	7,535,764	5.59	20,017,162	14.84	6,060,900	4.49	17,162,206	12.72	139,494	0.10	134,900,233
1860	216,009,648	68.31	12,166,447	3.85	38,624,949	12.21	12,641,625	3.99	35,811,383	11.33	988,371	0.31	316,242,423
1870	213,439,991	56.64	41,852,630	11.12	50,919,666	13.53	13,711,708	3.66	56,329,137	14.96	363,341	0.09	376,616,473
1880	238,787,934	28.98	266,108,950	32.30	193,352,723	23.47	29,044,159	3.52	92,774,139	11.26	3,878,448	0.47	823,946,353
1890	304,566,922	36.03	132,073,183	15.62	224,756,588	26.59	46,454,992	5.50	132,527,050	15.68	4,915,101	0.58	845,293,828
1900	325,244,296	23.73	225,906,246	16.48	319,696,334	23.32	153,275,660	11.18	331,746,896	24.20	14,894,539	1.09	1,370,763,571
1910	565,934,957	33.10	109,828,320	6.42	259,259,654	15.16	267,765,910	15.66	499,215,329	29.19	8,079,822	0.47	1,710,083,998
1914	792,716,109	34.03	137,495,121	5.90	293,218,336	12.59	374,224,210	16.06	724,908,000	31.11	7,122,249	0.31	2,329,684,025
*1915	510,455,540	18.80	506,993,179	18.66	454,575,404	16.74	355,862,329	13.10	807,465,511	29.73	†80,826,502	2.98	2,716,178,465

* See footnote on table, page 720.

† Chiefly horses and mules to Europe.

The conditions above noted, the increasing import of manufacturing material and tropical foodstuffs, and the increasing export of manufactures have had a marked effect upon trade with the various sections of the world, as shown in the table.

The decline in the exports to Europe was largely due to the reduction in the quantity of foodstuffs available for exportation, while the increase in exports to North and South America, Asia, Africa, and Oceania was due to increased activity in exports of manufactures, since manufactures are the chief articles imported into those sections of the world.

One feature of the trade of the United States which has received much attention in recent years is that with South America. This continent is looked upon by many as a field in which the United States should rapidly increase its trade by reason of what is usually considered its close proximity. In fact, however, the distance by steamship from the eastern parts of the United States to the southern frontage of South America is about the same as from western Europe to the South American frontage, while prior to the opening of the Panama Canal the eastern parts of the United States had no advantage over those of western Europe in the distance to the western part of South America. The opening of the Panama Canal, coupled with the suspension of the activities of the European exporters and European shipping during the War of 1914–16, resulted in a material increase in the share which the United States supplied to the imports of South America in the calendar year 1915. Another factor in the increase of commerce with South America is found in the disposition of American exporters to grant longer credits than they had formerly given, while the establishment of branch banks in several South American countries by the National City Bank of New York in 1914 and 1915 aided in a closer trade and financial relationship between the United States and South America.

Another feature of the commerce of the United States which has greatly developed during recent years is the trade with its noncontiguous territory. The exports to Alaska in 1904 were $9,510,000 and $21,260,000 in 1915; the imports therefrom were $10,229,000 in 1903 and $27,442,000 in 1915. To Porto Rico the exports of 1897, before the beginning of the war with Spain, were $2,252,000 and $30,930,000 in 1915; the imports therefrom were $1,690,000 in 1897 and $42,312,000 in 1915. To Hawaii the exports of 1897, the year before annexation, were $6,800,000 and $40,700,000 in 1915; the imports therefrom $15,962,000 in 1897 and $62,087,000 in 1915. To the Philippines the exports of 1898, the year before annexation, were $127,000, and $24,765,000 in 1915; the imports therefrom $3,830,000 in 1898 and $24,020,000 in 1915. Thus exports to the noncontiguous territories, which aggregated $16,690,000 in the years above named, were $97,645,000 in 1915, while the imports therefrom grew in the same period from $31,711,000 to $156,861,000.

The foreign trade of the United States in the period of the great European War (1914–16) showed many striking changes. The beginning of the war period was one of great confusion in trade matters. Exports of cotton greatly declined owing to the dangers of ocean transportation, and the manufacturers of the United States, uncertain as to the future of trade, reduced their importation of manufacturing materials. Soon, however, heavy demands were made by the warring nations for foodstuffs, horses, and then for war material, while cotton exports increased to nearly their normal. The exports of foodstuffs and horses enormously increased, as did also those of gunpowder and other high explosives, cartridges and shells, guns, automobiles, aëroplanes, harness and leather, military goods, hospital supplies, and other articles of this character required for war purposes. There was also an enormous increase in the exportation of sugar and other foodstuffs. As a result the total value of the exports to Europe rapidly developed in spite of the fact that Germany and Austria-Hungary, formerly large importers of American goods, were unable to obtain supplies from that market. The total value of merchandise exported to Europe in the calendar year 1915, the first full year of the war, was $2,505,660,000 against $1,499,573,000 in the calendar year 1913, the latest calendar year prior to the war. This increase occurred not only in the trade with the countries at war, but also in the exports of certain neutral countries adjacent to those at war. To the United Kingdom the exports of 1915 were $1,191,970,000 against $590,732,000 in 1913; to France $499,944,000 against $153,023,000 in 1913; to Italy $270,668,000 against $78,675,000; to Russia $169,100,000 against $26,910,000 in 1913, about one-fourth of this trade with Russia going by way of Asiatic Russia and being taken by rail to the battlefields. To Germany the exports of 1915 were but $11,789,000 against $351,931,000 in 1913, and to Austria-Hungary $104,000 against $22,145,000 in 1913. To Norway, Sweden, and Denmark, lying adjacent to Germany, the exports of 1915 aggregated $204,783,000 against $41,460,000 in 1913.

IMPORTS FROM AND EXPORTS TO EACH GRAND DIVISION, AND SHARE WHICH THEY RESPECTIVELY FORMED OF THE TOTAL, AT DECENNIAL YEARS 1800–1915

FISCAL YR.	Europe	Per cent of total	North America	Per cent of total	South America	Per cent of total	Asia	Per cent of total	Oceania	Per cent of total	Africa	Per cent of total
						IMPORTS						
1800	$46,857,960	51.35	$32,116,092	35.19	....	...	$11,560,810	12.67	$142,969	0.16	$551,496	0.60
1830	40,841,420	57.63	17,548,892	24.76	$6,239,176	8.80	5,531,737	7.80	384,887	0.54	308,797	0.44
1840	64,146,814	59.87	22,627,639	21.12	9,420,586	8.79	9,695,639	9.05	602,447	0.56	646,869	0.60
1850	124,954,302	70.14	24,136,879	13.55	16,647,637	9.35	10,315,486	5.79	1,401,340	0.79	682,151	0.38
1860	216,831,353	59.99	75,082,583	20.78	35,992,719	9.96	26,201,603	7.25	3,495,726	0.97	3,798,518	1.05
1870	249,540,283	53.98	126,544,611	27.42	43,596,445	9.41	31,413,378	6.78	1,423,212	0.31	9,860,058	2.10
1880	370,821,782	55.52	130,077,225	19.47	82,126,922	12.30	67,008,793	10.02	14,130,604	2.13	3,789,420	0.56
1890	449,987,266	57.14	148,368,706	18.84	90,006,144	11.43	67,506,833	8.57	28,356,568	3.60	5,084,892	0.42
1900	440,567,314	51.84	130,035,221	15.30	93,666,774	11.02	139,842,330	16.45	34,611,108	4.07	11,218,437	1.32
1910	806,270,280	51.76	306,767,486	19.69	196,164,786	12.59	193,155,344	12.45	37,099,795	2.38	17,489,739	1.13
1914	895,602,868	47.29	427,899,354	22.57	222,677,075	11.76	286,952,486	15.15	42,144,398	2.22	19,149,476	1.01
1915	614,354,645	36.70	473,079,796	28.26	261,489,563	15.84	247,770,103	14.80	52,522,552	3.14	24,953,081	1.49
						EXPORTS						
1800	41,348,088	58.26	27,208,608	38.34	....	...	1,177,846	1.66	14,112	0.02	1,110,374	1.56
1810	46,853,851	70.09	16,066,899	24.07	1,611,788	2.41	556,881	0.83	227,560	0.34	1,407,828	2.11
1820	48,116,538	69.04	16,810,597	24.12	1,133,689	1.63	3,289,000	4.72	8,906	0.01	305,968	0.44
1830	48,175,248	65.24	18,886,434	25.57	4,587,391	6.21	1,845,224	2.50	93,668	0.13	233,601	0.31
1840	98,930,684	74.89	23,737,078	17.97	5,969,517	4.52	2,256,290	1.73	454,814	0.35	717,583	0.54
1850	113,862,253	74.96	24,722,610	16.27	9,076,724	5.98	3,051,720	2.01	208,129	0.14	977,284	0.64
1860	310,272,818	77.54	53,325,937	13.33	16,782,100	4.18	11,067,921	2.77	5,373,497	1.34	3,227,760	0.84
1870	420,184,014	79.35	68,962,006	13.06	21,651,459	4.09	10,972,064	2.07	4,334,991	0.82	3,414,768	0.64
1880	719,433,788	86.10	69,437,788	8.31	23,190,220	2.77	11,645,703	1.39	6,846,698	0.82	5,084,466	0.61
1890	683,731,397	79.74	94,100,410	10.98	38,752,648	4.52	19,696,820	2.30	16,460,269	1.92	5,082,140	0.54
1900	1,040,167,766	74.60	187,594,625	13.45	38,945,763	2.79	64,913,807	4.66	43,391,275	3.11	19,469,849	1.39
1910	1,135,914,551	65.10	385,520,069	22.09	93,246,820	5.34	60,861,813	3.49	50,890,087	2.92	18,551,380	1.06
1914	1,486,498,729	62.86	528,644,962	22.36	124,539,909	5.87	113,425,616	4.80	83,568,417	3.53	27,901,515	1.18
1915	1,971,434,187	71.21	477,075,727	17.23	99,323,957	3.59	114,470,493	4.13	77,764,725	2.81	28,519,751	1.03

Foreign Shipping. The amount of tonnage entered and cleared in the foreign trade of the United States greatly exceeds that of any other country in the world. At one time the leading maritime nation in tonnage carried, the United States has steadily declined until in 1915, out of a total tonnage for the world of 49,261,769 tons, the United States had registered for foreign trade but 2768 vessels of 1,813,775 gross tons. In 1915 but 29 per cent of the United States foreign trade was carried in United States ships. The following table shows the tonnage entered and cleared at American ports at certain periods, giving the percentages carried in vessels of American registry and in foreign bottoms.

TONNAGE ENTERED AND CLEARED IN FOREIGN TRADE AND PER CENT IN AMERICAN VESSELS

	Total entered	Per cent American	Total cleared	Per cent American	Total trade	Per cent American
1821	846,624	91	888,020	91	1,734,689	90
1830	1,099,127	88	1,105,196	88	2,204,323	88
1840	2,289,309	68	2,353,495	69	4,642,804	69
1850	3,748,639	59	4,361,002	60	8,709,641	60
1860	8,275,196	71	8,789,929	70	17,065,125	71
1870	9,155,659	38	9,169,403	38	18,325,062	38
1880	18,010,649	19	18,042,899	18	36,053,548	19
1890	18,107,261	23	18,148,862	23	36,256,123	23
1900	28,163,005	22	28,281,141	22	56,444,146	22
1910	40,235,806	22	39,705,858	22	79,941,664	22
1915	46,710,466	28	46,885,088	29	93,595,554	29

The table on page 723 shows the imports and exports of the United States by nationality of vessels for the fiscal years 1914 and 1915, the former, it will be recalled, being previous to the great European War.

See MERCHANT MARINE OF THE UNITED STATES for history of American shipping; also SHIPBUILDING.

Shipping, Coastwise and Interior. Since 1789 the American navigation laws have practically, and since 1817 absolutely, prohibited any but American vessels from participating in the coasting trade of the United States. Therefore the enormous domestic trade of the United States—the seacoast, lake, and river trade—has always been monopolized by American shipowners and seamen. The facilities offered by the waterways of the United States greatly favor a large domestic shipping trade. There are 5200 miles of the United States frontier bordering on the ocean and the Gulf of Mexico and an additional 2100 miles on lake and river. Furthermore, there is no other country in which rivers afford so great access to the interior as the United States. It is stated that the United States has 26,410 miles of navigable streams. On the Atlantic coast there are a large number of rivers, from the St. Croix in Maine to the St. John's in Florida, that are navigable from 50 to 200 miles inland; and there is no very considerable stretch of the coast that is not able to participate in the coastwise trade, much of it being protected sounds or bays. The Gulf Coast region is similarly favored with navigable rivers and with ports. The Mississippi River system gives water communication with the vast portion of the interior of the country. The Pacific coast, with the notable exception of the Columbia River navigable to Portland and beyond, is less favored with navigable rivers or with port sites, but the inlets at San Francisco and Puget Sound have tributary navigable rivers and afford superior ports. (For river and harbor improvements, see HARBOR.) No other nation has a domestic seaboard or lake trade comparable with the American or a river trade that equals that of the United States. In 1915 the United States had 6,486,384 tons engaged in domestic coasting trade, while the United Kingdom in 1913 owned only 869,090 tons that were engaged in its own home trade.

IMPORTS AND EXPORTS OF UNITED STATES BY NATIONALITY OF VESSELS, FISCAL YEARS 1914 AND 1915

NATIONALITY OF VESSELS	Imports		Exports		Total imports and exports	
	1914	1915	1914	1915	1914	1915
American	$198,923,666	$281,334,841	$166,055,061	$284,410,965	$364,978,727	$565,745,806
Austrian	24,358,126	3,025,275	35,086,502	877,044	59,444,628	3,902,319
Belgian	35,461,566	7,053,131	12,504,875	15,439,965	47,966,441	22,493,096
British	852,672,141	694,219,523	1,172,354,610	1,394,215,920	2,025,026,751	2,088,435,443
Dutch	68,786,793	124,687,344	84,589,948	108,386,976	153,376,741	233,074,320
French	111,799,180	68,341,417	63,702,289	126,517,813	175,501,469	194,859,230
German	241,319,067	31,081,662	280,818,368	19,917,218	522,137,435	50,998,880
Italian	34,714,668	49,072,575	38,727,602	75,668,508	73,442,270	124,741,083
Japanese	55,305,703	68,080,817	25,657,162	36,004,988	80,962,865	104,085,805
Norwegian	66,475,681	115,729,291	65,552,041	158,416,411	132,027,722	274,145,702
All others	47,892,062	83,643,536	82,742,184	210,972,956	130,634,246	294,616,492
Total	$1,737,708,653	$1,526,269,412	$2,027,790,642	$2,430,828,764	$3,765,499,295	$3,957,098,176

In 1915, 1,088,091 tons of the American sail vessels were of wood and 296,383 tons of iron and steel. The steam vessels comprised 904,389 tons constructed of wood and 4,877,017 of iron and steel. On June 30, 1915, 23,072 vessels, with a tonnage of 6,486,384, were engaged in the coasting trade of the United States and were divided as follows: sailing vessels, 5048, with a tonnage of 978,806; steam vessels, 6357, of 4,444,587 tons; gas-propelled ships, 7886, of 133,980 tons; canal boats, 560, of 61,979 tons; and barges, 3221, of 867,032 tons. See SHIPBUILDING.

The most extensive coast trade centres in New York, largely with Boston on the one side and Philadelphia, Baltimore, Norfolk, Charleston, Savannah, Jacksonville, New Orleans, and Galveston on the other. San Francisco is an important centre of the coastwise trade on the Pacific coast, while the Puget Sound ports, especially Seattle and Tacoma, play an important part in the coasting trade with Alaska, and ports are being developed at Los Angeles and San Diego. In 1914–15 the Panama Canal (q.v.) was in operation, and this naturally affected the amount of water-borne freight from coast to coast, which previously had been transshipped by rail across the Isthmus of Panama. The shipping facilities afforded by the Great Lakes are of inestimable value. See GREAT LAKES.

Shipping on the Mississippi System.—Prior to the Civil War the Mississippi River system played a much more important part in the development of the interior of the country than did the Great Lakes. The river was but little navigated for purposes of commerce prior to 1778, and for many years it was of importance to its tributary region chiefly as a means of marketing the surplus products of the newly settled region, since freight could not be profitably transported upstream. The methods used to transport the freight downstream were of the crudest kind. The most common carrier was the flatboat, rudely constructed from timber and without any other propelling force than the current of the river. After it had carried its load to the New Orleans market it was broken up for lumber or deserted. In 1812 the first steamboat was placed upon the river, and, with the improvements that rapidly followed in steam navigation, the upstream traffic also became large. The years 1840–59 constituted the palmy days of Mississippi navigation. Since then, over the greater part of the Mississippi valley, the railroad has obtained most of the passenger traffic and most of the freight, except bulky products, chiefly coal and lumber. In 1914 but 698 steamers and 38 barges with 88,655 tons of freight arrived at St. Louis and but 694 boats with 48,935 tons departed from the port. In recent years the bulk of the traffic has been carried on barges towed by steamers. See MISSISSIPPI RIVER.

GOVERNMENT

National Government. The outline of the national government is found in the Constitution, framed in 1787 (see Constitution), and various acts of Congress passed in pursuance thereof. In structure and character it is a representative, federal, coördinated, elective, congressional government. Its representative character consists in the fact that the organization of the State is separate and distinct from that of the government. It is federal in that it is part of a dual system under a common sovereignty. The distribution of the legislative, executive, and judicial powers of the central government, among separate and distinct organs, contributes the feature of coördination. The popular choice of the executive and law-making branches makes the government substantially elective, while the independence of the executive as over against the legislative makes the system congressional rather than ministerial in method of action. In distributing the powers of government the framers of the Constitution followed Colonial and English precedent and confided to separate and distinct organs the exercise of those functions which were legislative in character, those which were executive, and those which were judicial. The investment of the President with the power to recommend to the legislative department the enactment of laws, the right of a qualified veto on its acts and resolutions, and the right of the lower branch of the Legislature to impeach and the right of the upper branch to try all officers of the United States for certain offenses, are well-known exceptions to the general principle of the separation of powers. The same may be said of the power confided to the upper branch of the Legislature to participate with the executive in the appointment of officers and the negotiation of treaties with foreign countries.

For the Constitution, see Constitutional Law; Constitution of the United States; Federal Government.

For the legislative branch, see Committee; Congress; Legislation; Legislature; Parliamentary Law; Quorum; Representation; Senate; Speaker; etc.

For the executive branch, see Cabinet; Electoral College; President; State, Department of; Treasury, Department of the; etc.

For the judicial branch, see Court; Supreme Court of the United States.

Congress.—The origin of the national Legislature is to be found in the so-called Second Continental Congress of 1775—a revolutionary body which was called to deliberate upon the state of public affairs growing out of the dispute with Great Britain, and which, with the acquiescence of the people, assumed plenary powers of government and the management of the war. Although its powers were undefined (there being no written constitution), the Congress exercised many of the usual functions of sovereign governments, among which may be mentioned the organization of a diplomatic service and the conclusion of treaties with foreign states; the regulation of commerce; the raising and equipment of armies; the establishment of a post office; the creation of a national currency; etc. Delegates were usually appointed by popular conventions of legislatures, the Congress was organized in one chamber, and the States enjoyed equality of representation. The Articles of Confederation, ratified in 1781, changed the basis of the Congress from a revolutionary assembly to a constitutional body and undertook to define its powers and regulate its constitution. The principle of equality of representation and the unicameral form of organization were, however, continued; besides, its efficiency as a national legislature was impaired by other unwise provisions. It did not possess the power of taxation, nor did its commands operate upon individuals, but rather upon States which could not be coerced. A few years' experience showed that it was unequal to the task of a national legislature, and when the Constitutional Convention of 1787 came to deliberate upon the structure and powers of Congress it was practically unanimous in favor of the bicameral organization and of vesting Congress with more adequate powers. The troublesome question of representation was settled by an arrangement which protected the small States by giving them equality of representation in one chamber, and the large States by proportional representation in the other.

Congress was given adequate power over the source of the national revenue, besides other powers inherent in a national legislature. All its powers were enumerated by the Constitution, while a number of express prohibitions were inserted in behalf of individual liberty. Lest an express enumeration of its powers might operate to deprive it of discretion in choosing the appropriate means of carrying into execution the powers granted, a so-called "elastic clause" was inserted empowering Congress to pass all laws deemed necessary and proper to carry out the powers expressed. Compared with the vast range of powers left with the States, the few powers conferred upon Congress seem quite insignificant, and this disparity seems all the more noticeable when compared with the omnipotence of the British Parliament. But the apparently narrow powers vested in Congress have been rather broadly construed by the Supreme Court throughout the entire period of the national history. With the sanction of the court, sometimes under the stress of emergency, but more frequently in time of peace, Congress has steadily extended its powers in every direction, exercising functions which were probably never intended by the framers of the Constitution to be assumed by it. Thus under the simple power to lay and collect taxes (doubtless for revenue only), Congress has employed its power to destroy State bank currency, to encourage certain industries and destroy others, and to restrict commercial intercourse. In pursuance of the power to coin money and pay debts it has established national banks, issued bills of credit, and given the legal-tender quality to its treasury notes. Under the power to establish post offices and post roads it has made a government monopoly of the entire postal service, established a money-order and parcels post system, and provided for free delivery of mail in cities and in many rural communities. Under the power to regulate foreign and interstate commerce it has regulated not only traffic, but telegraphic intercourse and navigation on rivers and canals. This power has been employed also for the purposes of prohibition, reciprocity, retaliation, and revenue. It has included the laying of embargoes, the enactment of nonintercourse and nonimportation and quarantine laws, the dredging of harbors, the erection of lighthouses, beacons, buoys, etc. Likewise Congress, without express authority, has acquired foreign territory, erected it into States, and governed its inhabitants without their consent. It has made large grants of land to aid in the construction of railroads, passed laws to regulate and control Federal elections, governed rebellious States through military agency, conferred suffrage upon the negroes, and undertaken to secure for them equality of treatment in public places. During the controversy over Reconstruction it encroached seriously upon the sphere of the executive and the courts declined to interfere in the latter's behalf.

In reviewing the first century and a quarter of the history of Congress and its place in the scheme of government, several criticisms are worthy of note. These are the practice of choosing members from local districts, short tenures of Representatives, the large and unwieldy size of the Lower House, the long interregnum between the time of the election and the organization of the Congress, the shortness of the second session, and the exclusion of the cabinet from seats in either House.

State Government. The Constitution of the United States provides that all powers not delegated to the United States nor prohibited by it to the States are reserved to the States respectively or to the people. Those powers absolutely prohibited to the States are the conclusion of treaties, alliances, or confederations among themselves; the granting of letters of marque and reprisal; the coining of money; the issue of bills of credit; the making of anything but gold and silver a tender in payment of debts; the enactment of ex post facto laws, bills of attainder, or laws impairing the obligation of contracts; and granting of titles of nobility. Those prohibited except with the consent of Congress are the levying of duties on imports or exports, except such as may be absolutely necessary for executing inspection laws; the laying of tonnage duties; keeping troops or ships of war in time of peace; entering into agreements or compacts with other States or foreign powers, or engaging in war unless actually invaded or when the danger is such as not to admit of delay.

Upon examination it will be seen that the relation of the citizen to the State government is far more close than with the national government. Nearly the whole domain of civil and religious liberty, education, suffrage, domestic relations, marriage, business transactions, property, professions, trades, contract relations, administration of the criminal law, and many other social and business relationships come within the sphere of the State government. The fundamental law of each State is embodied in a written constitution drawn up by a constituent convention and ratified in most cases by the electorate at the polls. The earlier constitutions were brief instruments containing little more than the law for the organization of the government and the necessary safeguards for the protection of civil liberty, but the later ones are bulky documents containing a vast amount of matter which should properly appear in the statutes. In each of the States the legislative power is vested in the Legislature, consisting of a Senate and a House of Representatives, though in six States the latter chamber is styled the Assembly and in three the House of Delegates. Both Houses are chosen by popular vote and by the same electorate, although there are variations as to the mode of choice and tenure. Usually the districts from which Senators are chosen are larger than those from which Representatives are elected, and as a consequence the Lower House is a more numerous body. The Senates range in size from 17 to 63 members, while the number of Representatives ranges from 35 to 390. The Lower House is from two to six times as large as the Senate. The tenure of State Senators is usually longer than that of Representatives. In a majority of the States it is four years, the usual term of a Representative being two years. In many of the States provision is made for partial renewal of the Senate, usually by halves every second year. In a few States the qualifications for eligibility to the Senate are higher than those of the Lower House. The franchise for the election of the Legislature and of all elective State officers is regulated by the State constitutions and is universal manhood suffrage, except that in Arizona, California, Connecticut, Delaware, Maine, Massachusetts, New Hampshire, Washington, Wyoming, and some of the Southern States slight educational tests are required, while in Arizona, California, Colorado, Idaho, Kansas, Oregon, Utah, Washington, and Wyoming women enjoy the suffrage equally with men. (For further details, see Suffrage; Representation.) In all the States members of the Legislature receive salaries, which are the same for members of both Houses. The amount ranges from $3 a day and mileage in Kansas and Oregon, or $2 and mileage for a regular session in New Hampshire to $1500 a year and mileage in New York and Pennsylvania. In most of the States the constitution provides for biennial sessions of the Legislature. In Massachusetts, Connecticut, Rhode Island, New York, New Jersey, and South Carolina annual sessions are required, while in Alabama regular sessions occur every four years. In most of the States the length of the session is left to the discretion of the Legislature, in others it is limited by constitutional provision. The powers of the Legislature relative to organization, procedure, adjournment, privileges, etc., are similar to those of Congress. The executive power in each State is vested in the Governor, popularly elected for a term ranging from one year in Massachusetts to four years in 22 States and five in New Mexico. In about three-fourths of the States there is a Lieutenant Governor, who succeeds to the governorship in case of a vacancy. The Governor's salary ranges from $2500 in Nebraska and Vermont to $10,000 in California, Massachusetts, New Jersey, New York, Ohio, and Pennsylvania, and $12,000 in Illinois. In a few States he is ineligible to succeed himself. His duties and powers include the execution of the laws, the furnishing of the Legislature with information at the beginning of its session, the calling of it together in extraordinary session, the appointment of certain officers, usually with the consent of the Senate, the granting of reprieves and pardons, the veto of legislative measures except in four States (see Veto), and the command of the militia. In several of the States where there has been a traditional fear of the executive power, the Governor's prerogatives are very narrow—he has no veto power and but little power of appointment. To aid the Governor in the administration there are in every State a number of executive departments, at the head of which are officers usually chosen at the same time, in the same manner, and for the same term as himself. These are the Secretary of State, the Treasurer, the Attorney-

General, the Auditor or Comptroller, and the Superintendent of Public Instruction. Besides, there are frequently such officers as commissioners of railroads and of canals, insurance, agriculture, labor, immigration, charities, etc. Formerly such officers were, as a rule, popularly elected, but in recent years there has been an increasing resort to commissions, especially for the control of public utilities, workmen's compensation, minimum wages, etc.; these are appointed by the Governor with consent of the Legislature. The position of the heads of the State executive departments is in no sense similar to that of the President's cabinet, since the Governor has little or no power over them.

In each State the judicial power is vested in a supreme court or court of appeal, one or more superior courts known by different names, and a series of local courts of various kinds. In several States the supreme court is such only in name, there being a court of last resort above it, usually known as court of appeals or court of errors and appeals. Texas has two supreme courts, one for civil and the other for criminal cases. The size of the supreme courts ranges from three justices to 16, the number usually being odd. The salaries of members of the State supreme courts range from $2500 in Vermont to $14,000 in New York. Next below the supreme court are the superior courts, sometimes called circuit courts, having jurisdiction over a group of counties with the power to hear appeals from the lower courts. Usually there is also a county court, which is known by different names and which has a wide original jurisdiction in both civil and criminal matters and appellate jurisdiction over the decisions of the justices of the peace. These justices of the peace have original jurisdiction in minor civil and criminal cases, with power to impose fines, to commit to prison for short periods, and to bind over accused persons to await the action of the grand jury. In the towns and cities there is usually a separate class of municipal courts. (See MUNICIPAL GOVERNMENT.) There are also probate and chancery courts in some States. Formerly the State judges were generally appointed by the Governor or chosen by the Legislature, but now in a great majority of the States they are popularly elected. In four States the Supreme Justices are still elected by the Legislature; in eight they are appointed by the Governor with the consent of the Council or Senate. The early rule was good-behavior tenure, but now that rule prevails only in Massachusetts, Rhode Island, and New Hampshire. Elsewhere the term varies from two years in Vermont to 21 in Pennsylvania.

Local Government. Three general types of local government prevail in the United States. They are the town system in New England, the county system in the South, and the mixed system in New York, Pennsylvania, New Jersey, and a number of the North Central States. In the town system the sovereign local authority is the town meeting, or general assembly of all the qualified voters of the town. A regular annual session of this assembly is held in the spring, and extra sessions are held throughout the year as necessity requires. At the annual meeting, which is presided over by a moderator, the town officers are elected, the local budget passed, and other matters of local interest decided upon. The principal town officers are a number of selectmen, ranging from three to nine, who are the general managers of the town affairs; the town clerk, who is the keeper of the records; the treasurer; the tax assessors; the tax collector; the school committee; and a variety of minor officers such as constables, overseers of the poor, surveyors, fence viewers, etc. Where the pure town system prevails the county plays but little part in local administration, and in some States like Rhode Island there are, strictly speaking, no county officers, the county being merely a judicial district without corporate personality.

In the Southern States, where the county type of local government prevails, conditions are reversed. There the county is the political unit, and the administration of all local matters, except educational and municipal affairs, is intrusted to county officers. The chief county authority is the board of county commissioners or supervisors, each member of which represents one of the magisterial districts into which the county is divided. There is no authority which corresponds to the New England town meeting. Besides the commissioners, the chief county officers are the sheriff, the clerk, the commissioner of education, the coroner, the assessor, and sometimes a tax collector, although the collection of the taxes is a duty generally imposed upon the sheriff. The subdivisions of the county in some States are known as precincts, in others as townships; in Delaware as hundreds, in Georgia as militia districts, in Louisiana (where the counties are called parishes) as wards, in Maryland as election districts, in Mississippi as supervisor's districts, etc. In the Southern States they are mere judicial or election districts. In each are usually to be found one or more justices of the peace and their ministerial officers or constables, but the districts are in no sense political corporations.

The mixed system which originated in New York and Pennsylvania is a compromise between the two types described above. Here both the town and county elements exist, but are combined in different ratios. In New York the chief local authority is the board of supervisors, consisting of a representative chosen from each town in the county. In Pennsylvania it is a board of three commissioners elected from the county at large. The New York supervisor presides over the town administration, while the Pennsylvania commissioner is in no sense a township officer. In the mixed type the town or township is a body corporate and politic. Each has its clerk, assessor, collector, commissioner of highways, justices of the peace, constable, etc. In New York there is an annual town meeting at which local officers are elected and matters of poor relief, taxes, schools, etc., attended to. In the pure Pennsylvania form the town meeting does not exist, town affairs being managed by a corps of officers elected by the people of the town. The New York, or supervisor, type of local government has been adopted in Michigan, Illinois, Wisconsin, Nebraska, New Jersey, and elsewhere. The Pennsylvania, or commissioner, system has been transplanted to Ohio, Indiana, Iowa, Kansas, and Missouri, and in a modified form to Minnesota and the Dakotas. For local government in the towns and cities, see MUNICIPAL GOVERNMENT.

FINANCES

Statistics. The finances of the United States are characterized by rapid increase in magnitude of fiscal operations, and by the great facility with which revenues are secured. The

Federal government has with rare exceptions derived nearly all its revenue from tariff duties and internal-revenue taxes, but the rapid expansion of expenditures in recent years forced it to resort to a tax on corporations in 1908 and to one on personal incomes in 1913. The total ordinary receipts for 1915 were $697,910,827. The principal sources were: customs, $209,786,672, a decrease of $82,533,000 from 1914 customs receipts due to the European War; ordinary internal revenue (taxes on spirits, fermented liquors, and tobacco), $325,467,887; corporation and income taxes, $80,201,758. These figures do not include postal revenues of $327,154,292 in 1915.

The most important items of expenditure are pensions, the post office, the army, the navy, and interest on the public debt. In 1915 the sum paid out in pensions was $164,387,941; the cost of the postal service was $332,591,112, nearly all of which was covered by postal receipts; the total of expenditures made by the War Department was $175,188,626, of the Navy Department $142,721,523. It must be remembered that part of the expenses of the War Department should not logically fall under that head, as, e.g., expenses for improvement of rivers and harbors. The total of expenditures for 1915 was $731,399,759.

The interest-bearing debt of the United States was $969,759,090 on July 1, 1915, and the total interest was $22,902,897. The debt which bears no interest, including United States notes and certificates against gold and silver deposited in the treasury, etc., amounted to $1,713,595,769. Only about one-fifth of the noninterest-bearing debt is to be regarded as net debt, since the greater part is covered by cash in the treasury.

Banks. See BANK, BANKING.

Budget. See BUDGET.

Financial History. Down to the adoption of the Federal Constitution the finances of the central government were in an extremely chaotic condition. In 1775 the Continental Congress undertook to establish a Continental army and navy, but no power had been delegated to Congress to raise revenue by taxation to meet the attendant expenditures. Congress was therefore forced to rely upon the issue of bills of credit, the proceeds of loans, foreign and domestic, and requisitions upon the various States, which the latter could honor or not as they saw fit. From 1775 to 1783 it is estimated that the income of the Continental Treasury, estimated in specie, amounted to $65,863,825, of which about $37,800,000 was secured through the issue of bills of credit, $19,416,000 through loans, and $5,795,000 through requisitions upon the States. National credit sank so low that in 1781 the continental bills of credit had fallen to 1 per cent of their face value. It was practically impossible, during most of the Revolutionary period, for Congress to borrow money at home or abroad; the foreign loans from France and Spain were rather in the nature of subsidies than of real loans.

Under the Articles of Confederation the financial position of the central government was but little stronger. It was provided that the expenses of the national government should be defrayed by taxes apportioned to the States in proportion to the value of land and improvements. Congress had power to emit bills of credit and to contract loans; but since the States levied the apportioned taxes according to their own discretion, there was no certainty that such loans could be repaid when due. By 1786 the credit of the government had fallen so low that it was practically impossible to secure loans, while the proceeds of the apportioned taxes did not meet the running expenses of government. Efforts to amend the articles so as to make possible a national tax proved unavailing, owing to the provision that unanimous consent of the States should be necessary for amendment.

From this state of affairs the country was rescued by the adoption of the Federal Constitution, which gave Congress wide powers of taxation. By the Act of July 4, 1789, import duties were levied; in the following year the national debt was reorganized and augmented by the assumption of the State debts incurred in the War for Independence. In 1791 the first national bank was organized to aid in placing the governmental finances on a sound footing. (See BANK, BANKING.) As the tariff of 1789 did not furnish revenue enough to meet current expenses, including the interest on the public debt, Congress in 1791 laid an excise tax upon spirits, which was further extended in 1794 to cover a considerable number of articles. In 1798 a direct tax was levied upon lands, dwelling houses, and slaves. Both the excise and the direct taxes were unpopular and unproductive, yielding in all only $1,582,000 in 1801. The customs duties, on the other hand, increased from $4,399,000 in 1791 to $10,751,000 in 1801.

From 1801 to 1811 revenue largely exceeded expenditures, in spite of the repeal of the excise taxes in 1802. The national debt was reduced from $83,000,000 to $45,200,000. With the outbreak of the War of 1812, customs duties fell off with the ruin of commerce, while military expenditures made a heavy drain upon the national resources. Excise duties were repugnant to the principles of the Republican party, then in power; accordingly it was necessary to finance the war chiefly by means of loans and the issue of treasury notes. Up to the end of 1814, $41,010,000 was borrowed; by February, 1815, $36,680,000 in treasury notes had been issued, of which, however, part was issued to pay off earlier issues, the largest amount outstanding being $17,619,000 in 1816. In 1813 a direct tax of $3,000,000 was levied, and in 1814 excise taxes were again imposed. These taxes were repealed in 1817 with the increase in customs revenue attendant upon the renewal of foreign commercial relations. From 1816 to 1835 revenue exceeded expenditures so far as practically to extinguish the national debt in the latter year. In 1836 and 1837 a surplus accumulated, which was distributed to the States in the guise of a loan in 1837, about $28,000,000 being disposed of in this way. An important item in the revenues of 1834–37 was the proceeds from the sale of public lands. From 1810 to 1830 the sales of public lands had yielded an annual income ranging from $1,000,000 to $2,000,000; in 1834 the yield was about $15,000,000; 1835, $14,767,000; 1836, $24,877,000; 1837, $6,776,000.

The table on page 728 gives receipts and expenditures for typical years from the adoption of the Constitution down to the Civil War.

The years 1837–43 showed a series of deficits owing to decline in revenue through commercial depression, and increase in expenditures due chiefly to greater expense in managing Indian affairs and the undertaking of internal improvements. It became necessary to resort again to the issue of treasury notes and the sale of bonds.

An increase in tariff rates in 1842 restored the balance and created a surplus, which was turned into a deficit by the expenses of the Mexican War. Between 1846 and 1851 the national debt increased from $15,550,000 to $68,304,000. By 1857 the debt had been reduced to $28,700,000. A new series of deficits began with 1858, which increased the indebtedness about $50,000,000 by 1860, when the Morrill Tariff Act restoring higher duties supplied revenue in excess of expenditures.

YEAR	Total ordinary receipts	Expenditures
1792	$3,669,000	$8,269,000
1801	12,935,000	9,393,000
1811	14,422,000	8,178,000
1814	9,800,000	34,720,000
1816	47,677,000	31,196,000
1821	14,573,000	15,842,000
1831	28,526,000	15,237,000
1841	16,860,000	26,482,000
1850	43,592,000	40,948,000
1860	56,054,000	63,201,000

For finances of the Civil War and the subsequent period, see DEBT, PUBLIC; FINANCE; SPECIE PAYMENTS, SUSPENSION OF; ETC.

Money. By an Act of March 4, 1900, the gold dollar weighing 25.8 grains was made the standard of value of the monetary system. The gold coins in common use, however, are the 5, 10, and 20 dollar pieces. Silver dollars, half dollars, etc., are also coined and accepted as convenient mediums of exchange. Silver and gold certificates are issued by the government, for the repayment of which a fund of $150,000,000 in gold has been established. For further particulars, see MONEY; COINAGE; ETC.

Weights and Measures. The United States system of weights and measures is fully discussed in the general article on WEIGHTS AND MEASURES.

ARMY

Military History. The first step towards the establishment of a military force under the control of the Continental Congress was taken June 15, 1775, when that body resolved that a general be appointed to command all the Continental forces raised or to be raised for the defense of American liberty and unanimously elected George Washington.

One year later (June 13, 1776) the Continental Congress created a Board of War, the germ of the modern War Department. The Revolution was a great war school for the crude but patriotic bands that rallied under Washington's standard, and the regular army of to-day rests upon the foundation then laid, after European methods. Thus the United States articles of war are copied from the British military code; the principles of discipline, drill, and accountability for property survive as they were prescribed by the aid-de-camp of Frederick the Great, Baron Steuben; while the French volunteer Baron du Portail became the first chief of engineers.

In September, 1776, the Continental Congress appointed a committee to confer with the general officers of the army with the view of creating a system of instruction which would furnish officers educated in the theory of military art and science. This was the origin of the Military Academy at West Point, which institution, however, was not formally established until 1802.

Notwithstanding Washington's wise counsel, that provision should be made for a permanent and well-equipped army, the close of the Revolution saw the seasoned veterans return to their farms and other civil avocations. Congress, swayed by the arguments that "standing armies in time of peace are inconsistent with the principles of republican government and dangerous to the liberties of a free people," and that "the United States being remote from nations having peace establishments and by being always in a state of defense, on the plan of the confederation, which provides that every State shall always keep up a well-regulated and disciplined militia," directed the discharge of "the troops now (May 26, 1784) in the service of the United States, except 25 privates to guard the stores at Fort Pitt and 55 to guard the stores at West Point and other magazines with a proportionable number of officers," no officer to remain in service above the rank of captain.

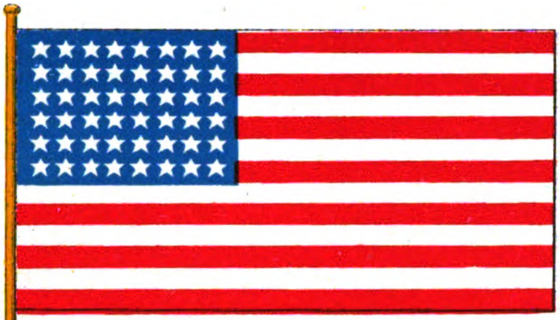
War with a civilized power was no sooner ended than the need of provision against Indian hostilities became apparent; the Articles of Confederation framed for protection against the greater danger were found ineffective in dealing with the lesser evil. The recommendations of Congress fell upon deaf ears; each State was busy with its own immediate affairs, and the Continental Legislature was compelled (June 3, 1784) to augment its nucleus of 80 enlisted men by the enrollment and equipment of a small regiment of foot soldiers; later (Oct. 20, 1786), a battalion of artillery was added, and so by degrees the nucleus of a national force was formed which in 1788 amounted to 595 men, commanded by Lieutenant Colonel and Brevet Brigadier General Josiah Harmar.

The establishment of a permanent land force for the national defense, otherwise known as the regular army, legally dates from March, 1789, a few weeks before the inauguration of Washington as President under the Federal Constitution. The troops then in service already mentioned now became the Regiment of Infantry and Battalion of Artillery and eventually (1791) became known as the First Regiment of Infantry (Lieutenant Colonel Harmar) and the Battalion of Artillery (Major Doughty) respectively.

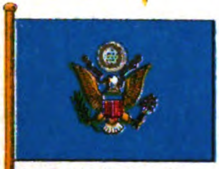
For more than 100 years after that date the army served as the strong right arm of the government, at times engaged in holding back the Indians from border settlements, protecting the western advance of the nation, and in five wars forming the backbone of the great forces called out to meet the emergencies. Withal the regular army performed these varied duties quietly but effectually. It produced Grant, Lee, Sherman, Sheridan, Thomas, Jackson, and a host of able commanders of less renown, but yet distinguished on the roll of fame. The conspicuous traits of the American regular are his individuality, fertility of resource, and unswerving loyalty to his government; the officers especially exhibiting, since the Spanish-American War, an unexampled capacity for the administration of civil affairs, assuming at a moment's notice duties ranging in importance from those of Governor-General and Judge of the Supreme Court to collector of customs and chief of police, and discharging them with marked ability and fidelity.

The Staff. Next to the training and equipment of the line and the selection of competent

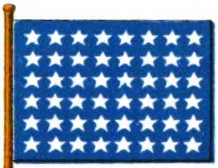
UNITED STATES FLAGS



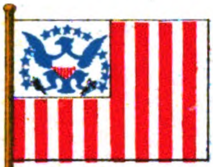
NATIONAL FLAG



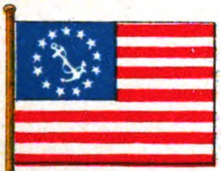
PRESIDENT'S STANDARD



UNION FLAG AND JACK
ALSO WORN IN BOWS OF BOATS CARRYING DIPLOMATIC OFFICERS OR NAVAL GOVERNORS OF GUAM OR TUTUILA.



FLAG CARRIED AT FOREMAST OF VESSELS OF REVENUE MARINE



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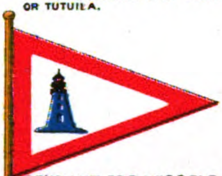
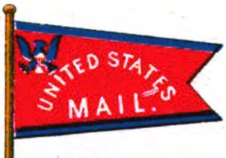
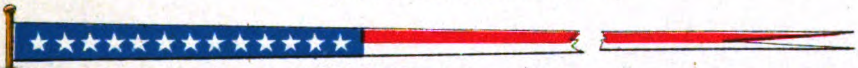


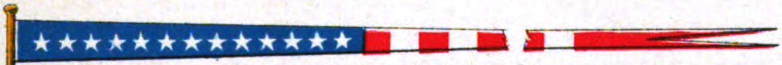
PENNANT FOR VESSELS IN THE LIGHTHOUSE SERVICE



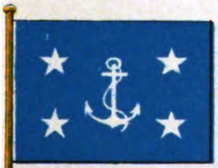
MAIL FLAG



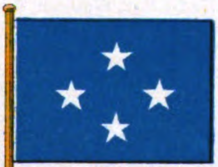
PENNANT



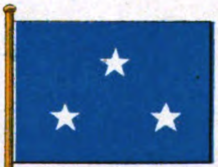
PENNANT REVENUE MARINE



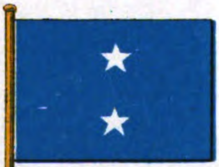
SECRETARY OF THE NAVY
ASSIST. SECY. THE SAME, SUBSTITUTING BLUE FOR WHITE AND WHITE FOR BLUE.



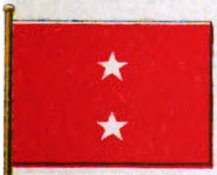
ADMIRAL OF THE NAVY



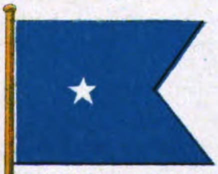
VICE-ADMIRAL SENIOR IN RANK
JUNIORS HAVE RED IN PLACE OF BLUE



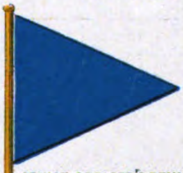
REAR-ADMIRAL SENIOR IN RANK



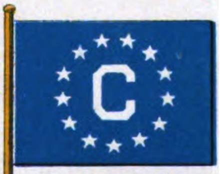
REAR-ADMIRAL JUNIORS IN RANK



COMMODORE'S BROAD PENNANT SENIOR IN RANK



SENIOR OFFICER'S PENNANT
WHEN NO FLAG OFFICER IS PRESENT



CONSULAR FLAG

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leaders, the question of a staff early received the attention of the Board of War. The value of the services of the foreign officers who as volunteers organized, drilled, and inspected the army and aided materially in achieving the success of the American operations had deeply impressed Washington, who upon the eve (1798) of his resuming the command of the army thus addressed the Secretary of War: "In forming an army, if a judicious choice is not made of the principal officers, and, above all, of the general staff, it can never be rectified thereafter. The character then of the army would be lost in the superstructure. The reputation of the commander in chief would sink with it and the country be involved in inextricable expense."

GENERALS COMMANDING AND CHIEFS OF STAFF OF THE ARMY OF THE UNITED STATES FROM THE FOUNDING OF THE REPUBLIC

NAME	From	To
George Washington*	1775	1783
Henry Knox*	1783	1784
Josiah Harmar‡	1783	1791
Arthur St. Clair*	1791	1796
James Wilkinson*	1796	1798
George Washington†	1798	1799
James Wilkinson‡	1800	1812
Henry Dearborn*	1812	1815
Jacob Brown*	1815	1828
Alexander Macomb*	1828	1841
Winfield Scott*	1841	1861
George B. McClellan*	1861	1862
Henry W. Halleck*	1862	1864
Ulysses S. Grant†	1864	1869
William T. Sherman†	1869	1883
Philip H. Sheridan†	1883	1888
John M. Schofield§	1888	1895
Nelson A. Miles§	1895	1903
S. B. M. Young,§ chief of staff	1903	1903
H. C. Corbin,§ chief of staff	1906	1906
J. C. Bates,§ chief of staff	1906	1906
Arthur McArthur,§ senior general	1906	1909
J. Franklin Bell, chief of staff	1906	1910
Leonard Wood,* chief of staff	1910	1914
Hugh L. Scott,* chief of staff	1914	....

* Major general. † General. ‡ Brigadier general. Josiah Harmar was a lieutenant colonel commandant and brigadier general by brevet. § Lieutenant general. Lieutenant General S. B. M. Young was the last commanding general of the United States army and became chief of staff under the legislation of 1903 on Aug. 15, 1903.

The first staff officers appointed by Washington upon assuming command at Cambridge (1775) were an adjutant general (Horatio Gates), a quartermaster-general (Thomas Mifflin), and a commissary general (Joseph Trumbull). Under them from time to time during the war were temporarily appointed officers of the line as assistants. As far back as 1777 the Continental Congress had "Resolved, . . . that it is essential to the promotion of discipline in the American army and to the reformation of the various abuses which prevail in the various departments that an appointment be made of inspectors general, agreeable to the practice of the best disciplined European armies." The first practical result of this action was shown in the selection of Baron Steuben, who may justly be considered the originator of much that is admirable in the staff system of the United States army. Although he had held the rank of lieutenant general in the Prussian army, he did not hesitate to serve at first as a volunteer, pending his appointment as inspector general with rank of major general (May 5, 1778).

At the close of the war Baron Steuben resigned his commission, receiving the thanks of Congress "for the great zeal and abilities he has discovered in the discharge of the several duties of his office," together with the gift of a "gold-hilted sword." Towards the close of his life Steuben prepared a manual of "Regulations for the order and discipline of the troops of the United States" and for governing the militia (Portsmouth, N. H., 1794), still a model of its kind.

Although, from time to time during the American Revolution, suitable persons were appointed to perform staff duties, yet the existing staff departments date their permanent establishment as follows: adjutant general's, March 3, 1813; inspector general's, March 3, 1813; judge advocate-general's (Bureau of Military Justice, 1864), July 5, 1884; quartermaster's, March 28, 1812; subsistence, April 14, 1818; medical, April 14, 1818; pay, April 24, 1816; engineers, March 11, 1779, (present corps of) March 3, 1863; ordnance, May 14, 1812; signal (corps), March 3, 1863. The *Journal of the Continental Congress*, Washington's orders, and the Revised Statutes teem with interesting historical and biographical data relating to these staff departments for which space here is denied. Out of the crude measures of a great crisis has grown a governmental system which, if not perfect, has through its personnel accomplished wonders. The names of Steuben, Trumbull, Rush, Morgan, Bernard, Townsend, Meigs, Ingalls, Myer, Fry, and Weston are those of a few of the men who, in spite of imperfections of organization, of official dry rot, and a false sense of security from perils that at times threaten the most favored nations, were equal to the emergency of war and achieved great distinction in their several departments. In these staff departments often have been felt the effects of legislation by Congress and schemes for the reorganization of the army.

STATISTICS OF THE UNITED STATES ARMY
1789–1916

	Strength of army	
1789	1 regiment infantry, 1 battalion artillery	840
1792	Indian border wars	5,120
1794	Peace establishment	3,629
1801	" "	5,144
1807	" "	3,278
1810	" "	7,154
1812	War with Great Britain	11,831
1815	" " " "	9,413
1817–21	Peace establishment	9,980
1822–32	" "	6,184
1833–37	" "	7,198
1838–42	Florida War	12,259
1843–46	Peace establishment	8,613
1847	Mexican War	17,812
1848	" "	30,890
1849–55	Peace establishment	10,320
1856–61	" "	12,931
1862	Civil War	39,273
1863–66	" "	43,332
1867	Peace establishment	54,641
1868–69	" "	52,922
1870	" "	37,313
1871	" "	35,353
1872–74	" "	32,264
1875–79	" "	27,489
1891	" "	27,390
1896	" "	26,955
1898	" "	63,000
1901	" " not to exceed	100,000
*1916	" " " " "	207,000

* From 1902 to 1916 the Law of 1901, with slight modifications, remained in force. This law, approved Feb. 2, 1901, authorised the President to enlist natives in colonial possessions, but required that the total enlisted strength of the regular army, including natives, should not exceed at any one time 100,000.

IMPORTANT CAMPAIGNS AND EXPEDITIONS

IN WHICH THE ARMY HAS TAKEN PART

1790–95	War with Northwestern Indians.
1794	Whisky Insurrection (Pa.).
1806	Sabine expedition (La.).
1811–13	War with Western Indians.
1812	Seminole disturbances (Fla.).
1812–15	War with Great Britain.
1813–14	Creek Indian War (Ala.).
1817–18	Seminole War (Fla.).
1823	Blackfeet Indian campaign.
1827	Winnebago Indian expedition.
1832	Black Hawk War.
1835–42	Seminole War (Fla.).
1836–37	Creek Indian disturbances (Ala.).
1836–39	Cherokee disturbances.
1838–39	New York frontier disturbances.
1846–48	Mexican War.
1848	Cayuse Indian War (Oreg.).
1849–61	Navajo Indian troubles (N. Mex.).
1849–61	Indian disturbances (Tex.).
1850	Pitt River expedition (Cal.).
1851–52	Yuma expedition (Cal.).
1851–56	Snake, Sioux, Yakima, Cheyenne, and Arapahoe Indian War.
1855–57	Seminole War (Fla.).
1857	Gila expedition (N. Mex.).
1857–58	Utah expedition.
1858	Puget Sound and other Indian troubles.
1858–59	Wichita (Ind. Ter.), Colorado River (Cal.), Pecos and Antelope Hills (Tex.), and Bear River (Utah) expeditions.
1859–60	Cortina troubles on Texas-Mexican border.
1860	Kiowa-Comanche (Ind. Ter.) and Carson Valley (Utah) expeditions.
1860–61	Navajo expedition (N. Mex.).
1861–86	Apache Indian War (Ariz. and N. Mex.).
1861–65	Civil War.
1862–67	Sioux War (Minn. and Dak.).
1863–69	Indian War (Kans., Neb., Colo., and Ind. Ter.).
1865–68	War with Northwestern Indians.
1865–66	Fenian raid (N. Y. and Canada).
1867–81	Campaigns against Indians and Mexican border disturbances.
1868–69	Canadian River expedition (N. Mex.).
1871	Yellowstone expedition.
1872–73	Modoc War.
1873	Yellowstone expedition.
1874–75	Indian campaign (Ind. Ter.), Sioux (Wyo. and Neb.), Black Hills (Dak.), and Big Horn (Wyo.) expeditions.
1875	Expedition against Indians (Nev.).
1876	Powder River expedition (Wyo.).
1876–77	Big Horn and Yellowstone expeditions (Wyo. and Mont.).
1876–79	War with Northern Indians.
1877	Labor strikes (Pa. and Md.).
1877	Nez Perces campaign.
1878	Bannock and Piute campaigns (Nev. and Idaho), and Ute Indian expedition (Colo.).
1879–84	Disturbances in Ind. and Okla. Ter., and Ute Indian campaign (Colo. and Utah).
1885	Chinese mining and labor troubles (Wyo. Ter.).
1890–91	Sioux Indian troubles (S. Dak.).
1891–93	Garcia troubles (Texas-Mexican border).
1892	Miners' disturbances (Idaho).
1894	Labor disturbances (Ill.), and labor strikes (Ill. to Pacific coast).
1898	War with Spain.
1899–1902	Philippine insurrection.
1900	China relief expedition.
1906–09	Cuban pacification.
1914	Occupation of Vera Cruz.
1911–16	Mexican border patrol.
1916–	Pursuit of Mexican bandit Villa.

Modern Establishment. The war with Spain (1898) called public attention to some of the imperfections of the American military administration, and discussion of the shortcomings brought about a plan of organization unprecedented in the history of the army. The Philippine insurrection, requiring the occupation of the archipelago at one time by a force of 65,000 men (regulars and volunteers), became in its turn an object lesson in the formation of a permanent military establishment suited to the new conditions. The regular force of 1897, expanded by Congress the following year to 63,000, was in 1899 reënforced by 35,000 volunteers, exceptionally efficient, as nearly all had seen service in Cuba and the Philippines, and were organized into regiments commanded by selected regular officers. During two years following these troops were incessantly engaged in fighting the Filipinos under the unfavorable conditions of climate, terrain, and the treacherous character of the enemy. Besides the service in the Philippines, the regular contingent there was drawn upon for the China relief expedition to the extent of 2000 men. For the first time since the Revolution the United States army fought side by side with European troops.

ENROLLMENT IN VARIOUS WARS

WAR OF THE REVOLUTION

Continentals	231,771
Militia	164,087
Total	395,858

WAR OF 1812

Regulars	38,186
Militia	458,463
Volunteers	10,110
Rangers	3,049
Total	509,808

WAR WITH MEXICO

Regulars	26,922
Volunteers	73,532
Total	100,454

CIVIL WAR

Regulars	46,669
Volunteers and Militia	2,637,080
Total	2,683,749

WAR WITH SPAIN

Regulars (June 30, 1898)	45,669
Volunteers	232,235
Total	277,904

On Feb. 2, 1901, Congress authorized a permanent increase of the army (discretionary with the President except artillery) not to exceed 100,000 men, including 12,000 native troops for service in Porto Rico and the Philippines. This force consisted of 15 regiments of cavalry, 30 of infantry, 3 battalions of engineers, a corps of artillery, and the staff departments. In June of that year all volunteers were mustered out. In July, 1902, the President, in the exercise of the discretion vested in him by law, the United States having recognized the independence of Cuba and having placed the greater part of the Philippine Islands under civil government, materially reduced the army until the aggregate strength in 1907 was 4016 officers and 68,301 men.

The most radical change in the organization was that of the artillery. For many years nominally it was regimental, but practically the unit for administration and operation was the battery. The system of coast defense lacked cohesion, consisting simply of a number of independent posts commanded by officers who, having reached the rank of field officer after 30 or 40 years' service as light battery commanders in the Civil War or with infantry garrisons in peace, were content to rest on their laurels. Under the influence of Secretary of War Root the seven regiments of artillery were merged into a corps, supervised by a chief, with his station at the headquarters of the army, and consisting of 126 companies of coast artillery and 30 batteries of field artillery. The companies were grouped within a number of artillery districts, and each district placed under command of a competent field officer. In 1907 the corps was reorganized into two separate branches of the service, the field artillery being increased and organized as six regiments of two battalions each, each battalion consisting of three batteries of four guns each.

RELATIVE STRENGTH OF UNITED STATES REGULAR ARMY TO POPULATION *

YEAR	Officers	Men	Total	Per cent.
1790	57	1,216	1,273	[illegible] of 1
1800	318	4,118	4,436	[illegible] of 1
1810	774	9,147	9,921	$\frac{14}{100}$ of 1
1820	712	8,230	8,942	[illegible] of 1
1830	627	5,324	5,951	[illegible] of 1
1840	733	9,837	10,570	[illegible] of 1
1850	948	9,815	10,763	[illegible] of 1
1860	1,108	12,259	13,367	[illegible] of 1
1870	2,541	34,534	37,075	$\frac{10}{100}$ of 1
1880	2,152	24,357	26,509	[illegible] of 1
1890	2,168	24,921	27,089	[illegible] of 1
1900	2,486	,65,669	68,155	[illegible] of 1
1905	3,934	63,022	66,956	[illegible] of 1
1910	4,633	82,643	87,276	[illegible] of 1
1915	4,798	101,195	105,993	$\frac{10}{100}$ of 1

* Records, Adjutant General's office.

Another important item in the legislation of 1901 was the change from a permanent to a detailed staff. By the law vacancies occurring in the adjutant general's department, the inspector general's department, the subsistence, pay, and quartermaster departments (later consolidated as the quartermaster corps, q.v.), the ordnance department, and the signal corps are filled by detailing officers of the line for four years only, after which they return to the line regiments. The general staff corps was established in 1903, the chief of which, selected by the President for a term of four years only, replaced the commanding general of the army, who formerly commanded by virtue of his seniority and retained command until retired from active service. Under the new system the President, the commander in chief of the army and navy, selects the general officer, irrespective of his rank, who in his opinion most satisfactorily can carry out the views of the administration with respect to the army.

After the creation of the general staff corps in 1903 the War College (q.v.) was established at Washington, D. C. For other schools, see MILITARY EDUCATION.

Strength.—The actual strength of the entire military establishment on June 30, 1915, by branches of service, is shown in the accompanying table.

BRANCHES OF SERVICE	Officers	Enlisted men	Total
General officers	25	....	25
Staff corps and departments	1,012	*10,896	11,908
Engineers	207	1,948	2,155
Cavalry	778	14,646	15,424
Field artillery	262	5,664	5,926
Coast artillery corps	728	19,185	19,913
Infantry	1,604	36,123	37,727
Miscellaneous	.....	7,303	7,303
Total regular army	4,616	*95,765	100,381
Total authorized regular army	4,334	97,248	102,082
Philippine Scouts	182	5,430	5,612
Aggregate	4,798	*101,195	105,993

* Includes 3993 enlisted men of the hospital corps and 4388 enlisted men of the quartermaster corps not counted as part of the combatant force proper.

The geographical distribution of the army on June 30, 1915, is shown in the following table.

GEOGRAPHICAL DISTRIBUTION	Officers	Enlisted men	Total
In the United States	3,502	64,756	68,258
In Alaska	23	747	770
In the Philippine Islands:			
Regular army	455	12,454	12,909
Philippine Scouts	182	5,430	5,612
In China	45	1,361	1,406
In Porto Rico	37	670	707
In Hawaii	322	9,199	9,521
In the Isthmian Canal Zone	192	6,151	6,343
Troops en route and officers at other foreign stations	40	427	467
Total	4,798	101,195	105,993

Organized Militia.—According to the 1915 returns the total reported strength of the organized militia was 8705 commissioned officers and 120,693 enlisted men. Of this force 1406 officers and 5446 enlisted men belonged to the staff and noncombatant branches, 440 officers and 7438 enlisted men belong to the coast artillery, and 6859 officers and 107,809 enlisted men to the mobile branches (engineers, field artillery, cavalry, and infantry). The mobile troops, with auxiliary forces, were organized into 12 tactical divisions in accordance with a plan formulated by the War College and the Division of Militia Affairs. No divisional unit in 1916 was complete in every detail. The National Guard of New York in its organization was the closest approximation to a complete divisional unit.

Military camps of instruction for students of educational institutions first were held in 1913 and were continued, in following years, when camps also were established for business men. At first as there were no funds available to meet expenses incident to the establishment of these camps, it was necessary to have them at military posts, where the ordinary utilities of the post could be used, or, if at a place other than a military post, the citizens had to incur the necessary expenses in constructing the camps. Four camps were successfully maintained during the summer of 1915—at Plattsburg Barracks, Chickamauga Park, Ludington, Mich., and at the Presidio of San Francisco, Cal.

The army budget for 1914–15 was $101,977,802, which did not include expenditure by the States for their organized militia, nor the large sums expended annually by the Federal government for military pensions.

Organization of the Army and Organized Militia. Under the constitution the President is commander in chief of the army, the administration of which is in the hands of a civilian Secretary of War, who is a member of the cabinet, and an Assistant Secretary of War, also a civilian. The chief of the general staff, a general officer of the army, selected and appointed by the President for a term of four years, is the military adviser of the President and the Secretary of War and has general supervision over the staff bureaus and the line of the army, exercising authority in the name of the Secretary of War and not by virtue of his rank, which may be inferior to that of other general officers.

Higher Organization.—For the first time in the history of the army in peace the President, on Feb. 6, 1913, directed that an order be issued organizing the troops of the mobile army into permanent tactical divisions and brigades. Although in 1916 the divisions were incomplete, there were three infantry divisions within the continental limits of the United States, with headquarters as follows: first division, Governor's Island, N. Y.; second division, Chicago, Ill.; third division, San Francisco, Cal. One cavalry division was organized with headquarters at San Antonio, Tex. There were also two independent cavalry brigades. The coast artillery troops in the United States were organized into three coast artillery districts—the North Atlantic, the South Atlantic, and the Pacific. The three infantry regiments in Hawaii were organized as the First Hawaiian Brigade. The troops in the Philippines were not organized as a tactical division. In the Panama Canal Zone was stationed a reënforced brigade.

Peace Establishment. From 1903 to 1916 the organization of the army in respect of units was as follows: Infantry, 30 regiments, each of 3 battalions of 4 companies, and a Porto Rico regiment (native) of 2 battalions of 4 companies each. Two of the 30 regiments were composed of negroes with white officers. Strength of company, peace, 3 officers and 65 to 150 men; war, 3 officers and 142 men. Cavalry, 15 regiments, each of 3 squadrons of 4 troops. Two were negroes with white officers. Strength of a troop, peace, 3 officers and 71 to 80 men; war, 3 officers and 100 men. Field artillery, 6 regiments of 2 battalions each, each battalion of 3 batteries of 4 guns each. There were 2 light artillery, 2 mountain artillery, 1 horse artillery, and 1 heavy artillery regiment. Strength of a battery, peace, 5 officers, 133 to 161 men; war, 5 officers, 171 men. Coast artillery, 170 companies, each 3 officers, enlisted men (varied according to service), 104 to 150. The engineers were organized as 3 battalions, each of 4 companies of 3 officers and 159 men each, and formed a part of the corps of engineers. Philippine Scouts (natives) in 1916 were organized as 52 companies, each of 3 officers and 104 men; total, 5915 officers and men. Indian Scouts, 75.

Army Law of 1916. Under the Act signed June 3, 1916, a great increase, accompanied by many changes, was authorized. Under this Act, the army of the United States "consists of the Regular Army, the Volunteer Army, the Officers' Reserve Corps, the Enlisted Reserve Corps, the National Guard while in the service of the United States, and such other forces as are now or may hereafter be authorized by law." The Regular Army, inclusive of existing organizations, thus consists of 64 regiments of infantry, exclusive of the Porto Rican Regiment; 25 of cavalry; 21 of field artillery; a coast artillery corps; of the staff corps and department; of the military academy; and of various other units and subsidiary organizations. The increases contemplated were to be made in five yearly increments, beginning July 1, 1916. The number of general officers was increased by 4 major and 19 brigadier generals. The general staff, increased to 55, had its functions severely limited by the law. Increases were made in the other staff corps, and to the engineers were given 7 regiments and 2 mounted battalions. The medical corps was to consist of 7 officers for every 1000 of enlisted strength. In the signal corps was authorized an aviation section to consist of 148 officers, 114 being first lieutenants, selected from the army at large. The coast artillery was increased to about 30,000 men, and the composition of brigades, divisions, and so forth was set forth. The infantry regiment was to consist of 5 field and 46 subaltern officers, and of one headquarters company, one machine-gun company, and 12 infantry companies, these to be grouped into 3 battalions of 4 companies each. A similar organization was provided for the cavalry regiment, 14 troops, of which 12 were to form 3 squadrons of 4 troops each. The number of batteries in a field artillery regiment was not fixed, but the total number in this arm was to be 126, and each regiment was to have such number of gun and howitzer battalions "as the President may direct." To provide for various details, the line of the army was increased by 822 extra officers of infantry, cavalry, field and coast artillery. The composition of the Regular Army Reserve was fixed, and conditions of service and pay laid down; a reserve corps of officers was created, not subject to call for service in time of peace, the Medical Reserve Corps abolished, and an Enlisted Reserve Corps created, to furnish men to the engineer, ordnance, medical, and other departments of the army. By the provisions of the law relating to the National Guard, the number of enlisted men of this force was ultimately to reach the ratio of not fewer than 800 men for each Senator and Representative in Congress, with a period of enlistment of 6 years, 3 with the colors and 3 with the reserve. Moreover, an oath of enlistment was provided, under which each affiant bound himself to obey the orders of the President and of the Governor of the State, etc. A similar oath, a "federal" oath, was to be required of officers. These and other provisions had for their object the federalization of the National Guard, so as to make of it a Federal as well as a State force. This feature is further emphasized by the admission of officers and men to the national payrolls. At the end of the five-year period, the strength of the active army under the law of 1916 would be 207,000 men, or, according to some authorities, even greater than this.

NAVY

Naval History. The first definite provision for a naval establishment was the Act of Congress of Oct. 13, 1775, which authorized the building of one vessel of 10 guns and another of 14 guns to be equipped as national cruisers. At the same time a law was passed establishing a marine committee, consisting of John Adams (later replaced by Christopher Gadsden), John Langdon, and Silas Deane. This congressional committee was later enlarged to 13 and given charge of all matters pertaining to the navy.

On October 30 two more vessels were authorized, one of 20 and the other of 36 guns; while on December 13 the construction of 13 ships was provided for. On November 10 an Act for the "public defense" authorized the raising of 2 battalions of marines and established rules for the "government of the American navy." The marines authorized were in reality sailors, for the Act provided "that particular care be taken that no persons be appointed to offices, or enlisted into said battalions, but such as are good seamen, or so acquainted with maritime affairs as to be able to serve to advantage by sea when required." It is probable, therefore, that Congress designed by the Act to provide crews for such vessels as they were able to equip and to enlist and keep the men together until their services could be made available.

As the vessels authorized to be built could not be completed for some time, a number of merchantmen were purchased and armed. These improvised men-of-war, hastily and poorly equipped and armed and in many cases very badly officered and manned, constituted the first American naval force, of which, by Act of Congress of Dec. 22, 1775, Esek Hopkins was made commander in chief.

The vessels of the improvised navy were directed to cruise along the coast and intercept transports laden with munitions of war for the British army and navy. In March, 1776, in command of a small squadron which included nearly all the vessels as yet in service and consisted of the *Alfred* (24 guns), *Columbus* (20), *Cabot* (14), *Andrea Doria* (14), *Providence* (12), and *Wasp* (8), Hopkins captured the British naval station at Nassau, Bahamas, obtaining a quantity of military and naval stores, including nearly 100 cannon, which were much needed for the new ships. The prisoners included the Royal Governor of the island.

On March 23, 1776, letters of marque and reprisal were granted against Great Britain, and numerous privateers were fitted out. On June 25 a marine corps (q.v.) was established, consisting of 1 major, 9 captains, 10 first lieutenants, and 7 second lieutenants.

After the Declaration of Independence Congress began the building up of the navy with increased vigor, and on October 3 it ordered another frigate and two cutters, and on November 9 an Act was passed authorizing the construction of three 74-gun ships, five more frigates, a sloop-of-war, and a packet; and these were to be supplemented by another frigate and another sloop-of-war ordered in January, 1777. But the plans of Congress were quite beyond the capacity of the Colonies to carry out. One 74-gun ship was laid down at Portsmouth, N. H., and completed in 1781—too late to be of service. Her armament was reduced to 56 guns, and during the next year she was presented to the King of France to replace the 74-gun ship *Magnifique*, which was lost in Boston harbor. Many of the vessels built never got to sea, and the real work performed by the navy during the Revolution was done by a dozen vessels, most of which were small.

On Nov. 15, 1776, Congress established the relative rank between officers of the army and navy as follows: admirals to rank with generals, vice admirals with lieutenant generals, rear admirals with major generals, commodores with brigadier generals, captains of ships of 40 guns and upward with colonels, captains of ships of 20 to 40 guns with lieutenant colonels, captains of ships of 10 to 20 guns with majors, lieutenants with captains, and officers of marines with officers holding similar commissions in the land service. Notwithstanding this act, no rank higher than that of captain was created by law until 1862, though the title of admiral (q.v.) was given to John Paul Jones in the official correspondence of the State Department in 1792, a short time previous to his death.

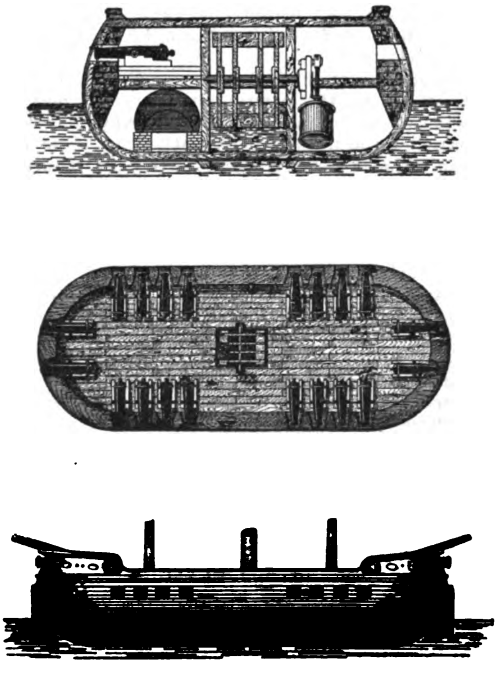
From the close of the Revolution until 1795 the country was practically without a navy, largely from lack of money to support one. The cause of its reëstablishment was the depredations of the Barbary pirates. On March 3, 1794, President Washington sent a message to Congress communicating the facts in regard to the Algerian outrages, and Congress promptly passed an Act, which was approved on March 27, authorizing the purchase or construction of six frigates. It was provided that no vessel should mount less than 32 guns. An additional provision was that all proceedings under the Act should cease in case the Algerian difficulty should be settled. Measures were immediately taken for the construction of the vessels, which consisted of the *Constitution* (q.v.), *President*, and *United States* of 44 guns, and the *Chesapeake* (q.v.), *Constellation*, and *Congress* of 38.

In November, 1795, a treaty was signed with the Dey of Algiers, and all work on the vessels was suspended. The President immediately called the attention of Congress to the subject, and an Act was passed without delay ordering the completion and equipment of two of the 44's and one of the 38's. The treaty of peace with the Dey of Algiers cost nearly a million dollars, the price of three frigates, and the President, in his annual address to Congress in December, 1796, strongly recommended laws for the gradual increase of the navy. The outrageous proceedings of the French cruisers on the United States coast did what no representations of the government could achieve, and in April, 1798, Congress grudgingly authorized the President to build, purchase, or hire 12 vessels, none of which was to exceed 22 guns, and see that they were regularly manned and equipped. This Act was passed on April 27, and on the 30th a regular Navy Department was created separate from the Department of War, of which it had previously formed a part. Benjamin Stoddert of Georgetown, D. C., was the first Secretary, and he entered on his duties in June. On June 11 a new marine corps was established, and during the year a number of additional small vessels were authorized.

The quasi war with France soon terminated with credit to the newly born service; nevertheless Congress was so opposed to any form of preparedness and so imbued with false ideas of economy that the navy would have been reduced to comparative uselessness had not the Barbary Powers repeated their acts of aggression. The Act of 1801 greatly reduced the personnel, and somewhat more than half the ships were sold. The operations of the Tripolitan War were highly creditable to the navy and greatly raised its esprit du corps and efficiency. Nevertheless it underwent another reduction at the hands of Congress. All but one or two of the larger vessels were laid up, and the few officers and men retained were mostly employed in small worthless gunboats. Whether President Jefferson or Congress devised the gunboat policy is uncertain, but both were earnest advocates of it. While this system was being developed the incident of the *Chesapeake* and *Leopard* occurred and saved the navy from complete demoralization, though the incident itself was discreditable both to the country and to the naval service. Neither the aggressions of England and France and the murder or imprisonment of thousands of American citizens nor the danger of war with Spain could rouse Congress to a sense of duty, to prepare to resist the outrages which were daily growing worse. The whole government seemed to have adopted a policy of hopeful waiting, the President confining his efforts of resistance to feeble diplomatic protests ending in the disastrous embargo which inflicted a damage of one hundred millions upon the merchant marine and commerce, while Congress did nothing except to squander the price of several line-of-battle ships in building 257 gunboats. Finally, in January, 1809, a bill was passed by which the navy was more than quadrupled in personnel and four of the larger vessels put in commission. But still no battleships were ordered until after the brilliant victories of the *Constitution* and *United States* had roused popular enthusiasm. It was then too late to complete them before the war closed. Opposed to this pitiful showing, Great Britain had 1060 vessels. Notwithstanding this disparity in force, the United States navy achieved world-wide renown and won the respect of the country. In 1815, shortly after the close of the war, the navy was reënforced by three ships of the line of 74 guns, the *Independence*, *Franklin*, and *Washington;* two frigates of 44 guns, the *Guerrière* and *Java;* and the steam man-of-war *Demologos.*

Immediately after the close of the war with Great Britain a squadron under the command of Commodore Decatur was sent to punish the Barbary powers, particularly Algiers, for wanton aggressions upon United States commerce during the war, which prevented action being taken at the time. In 60 days after his arrival in the Mediterranean Decatur had captured the principal vessels of the Algerian navy and had forced treaties on Algiers and Tunis which compelled these faithless pirates to a recognition of maritime right.

In considering the operations of the War of 1812 it is interesting to speculate upon what might have occurred had the war lasted another year. In 1813 Robert Fulton submitted to President Madison plans for a sea-going steam battery. His plans were accepted, and in March, 1814, Congress authorized the building of one or more of such batteries for the defense of the coast. Fulton died in February, 1815, but the *Demologos* (voice of the people) was completed in the following spring and had successful trials in June. On July 4, 1815, she made a trip to sea and back, steaming 53 miles in 8 hours and 20 minutes. Her length was 156 feet, beam 56 feet, depth 20 feet, and she measured 2475 tons, or more than a line-of-battle ship and 1000 tons more than the *Constitution*, although her cost ($320,000) was only $17,000 more than the first cost of the latter. Her sides were 5 feet thick and impenetrable to any guns carried by British ships, while her battery consisted of 20 guns, which were heavier than any then afloat. A furnace was fitted for heating shot, and there were pumps for throwing cold or hot water on the enemy's deck. The propelling apparatus of the *Demologos* consisted of a single paddle wheel in the centre of the ship, operating in a channel extending the length of the ship below the gun deck and dividing the underwater body into two parts, which were held together by the upper works and transverse frames at the bottom. Had this vessel got to sea before the conclusion of hostilities and met the warships of the enemy, it is tolerably certain that she would have destroyed the heaviest squadrons with ease and caused a revolution in naval affairs. As it was, however, her powers remained unproved, and the natural conservatism of the naval authorities, accustomed to the use of sails, caused her to be looked upon as an interesting experiment of no great practical value. She was therefore tied up alongside the wharf at the Brooklyn Navy Yard and used as a receiving ship. On June 4, 1829, her magazine blew up, killing 24 persons and injuring 19.



THE DEMOLOGOS.

The successful performance of the *Demologos* (or *Fulton*, as she was afterward called in honor of her designer) led Congress in 1816 to authorize the construction of another steam battery. But the conservative officers at the head of affairs in the navy could not understand the importance of steam-propelled ships, and it was not until 1835 that measures were taken to carry out the provisions of the law. In the meantime a number of ships of the line were commenced, 10 in all, and some of them took part later in the Mexican War. In 1835 the Secretary of the Navy, acting upon better advice, directed the Board of Commissioners to proceed at once to the construction of a steam man-of-war. In 1837 it (the *Fulton*) was completed and tried, a speed of 12 knots being realized. The propelling power consisted of side paddle wheels and engines on the upper deck. Several other paddle-wheel vessels were built in the next few years, one of which was the iron steamer *Michigan*, which is still on the navy list—the first iron vessel in the navy and also the first one afloat on the Lakes. In 1842–43 the screw steamer *Princeton* (of about 1000 tons) was built and fitted with machinery designed by John Ericsson. She was the first war vessel in any navy to be fitted with screw propulsion, and likewise the first to have all her machinery and boilers below the water line and to have blowing fans for forcing the draft under the boilers. A congressional committee, after considering the advantages of the submerged propeller and iron hulls, recommended in 1846 that 13 screw steamers of iron be immediately constructed. When authority for the construction of four war steamers was granted in the following year, a board of prominent naval officers recommended that three of the four should have paddle wheels. The fourth was the

San Jacinto, and it as well as the others was built of wood. In 1854 Congress ordered the building of "six first-class steam frigates to be provided with screw propellers." These vessels were the celebrated ships of the *Merrimac, Niagara*, and *Wabash* class. They were of fine model for their day and should have had good speed, but instead of having full steam and auxiliary sail power they had full sail power and only auxiliary engines. They were followed, however, in 1857 by the steam frigates of the *Hartford* class, in which the engine power was relatively considerably increased.

The operations of the navy in the Civil War soon showed the true importance of steam and the uselessness, or worse than uselessness, of sails. Even after the close of the war the practice of giving full sail power to cruising men-of-war was continued from mistaken ideas of economy, though during the war the rigged ships had been very generally stripped of yards and upper masts. The practice died hard, and it was not until 1887 that a full-sail rig was abandoned for cruising vessels. The ill-fated *Maine* was the last ship for general service to be designed to carry a heavy square rig, but this was changed to military masts before her completion.

The importance of possessing armored vessels was realized as soon as the Civil War commenced, and on both sides an investigation of the subject of armored ships was begun at once. The Confederates started work first, but the superior resources of the North enabled the first really armored ships to be completed on practically the same day. Both *Monitor* and *Merrimac* (Virginia) were fatally defective in details, but many of the defects were corrected in later vessels of the same types. See Ship, Armored.

After the close of the Civil War the navy again sank into decadence, the enormous expenses entailed by the war causing Congress to cut down appropriations in every direction. The personnel of the regular service was increased just after the end of the struggle, but it was cut down later, the last cut being in 1882, just as new construction was about to commence. During the interval 1866–82 only a few vessels were authorized—five monitors of 4000 to 6000 tons and about a dozen wooden cruisers, only one of which (the *Trenton*) was over 2000 tons. Old vessels were repaired and kept going, but nothing new was attempted, the wooden cruisers mentioned being out of date when put in service. So that, in 1880, the United States navy, with its antiquated ships and no less antiquated ordnance, was the laughingstock of the world and in power below that of several of the small republics of South America. Finally, in 1881, a board was appointed by the Secretary of the Navy to consider the needs of the service. This board recommended the building of 68 vessels of various types.

Congress appropriated for two and at its next session increased the number to four, but reduced the size. The first of these Acts was passed Aug. 5, 1882, and in addition to the provision for the two ships made a sweeping cut in the number of officers, which blocked promotion for 10 years and subsequently caused endless trouble through the deficiencies in the numbers produced by it. Five monitors were started early in the seventies, but work on them had long since ceased when it was revived by the Act of 1882 which appropriated $400,000 towards their completion. In the next session $1,000,000 additional was appropriated, but the succeeding Congress withdrew all unexpended balances of this. From this time on each Congress made some addition to the navy. In 1886 the *Maine* and *Texas* were provided for and in 1890 three battleships of the *Oregon* type. In deference to the very general prejudice which existed against the high-sided, broadside battleships of European navies, these ships were given rather low freeboard and were called coast-line battleships. But the *Iowa*, which was next built, was frankly described as a seagoing battleship, the unreasoning prejudice in favor of the nearly useless low freeboard monitor having been much modified.

BATTLESHIPS OF THE UNITED STATES NAVY

NAME	Tons	Main battery	Speed (knots)
Dreadnought type:			
Oklahoma	27,500	10 14-in.	21
Nevada	27,500	same	21
New York	27,000	same	21
Texas	27,000	same	21
Arkansas	26,000	12 12-in.	21
Wyoming	26,000	same	21
Florida	21,825	10 12-in.	21
Utah	21,825	same	21
Delaware	20,000	same	21
Michigan	16,000	8 12-in.	21
So. Carolina	16,000	same	21
Predreadnought type:			
Connecticut	16,000	4 12-in. 8 8-in.	19
Kansas	16,000	same	19
Louisiana	16,000	same	19
Minnesota	16,000	same	19
New Hampshire	16,000	same	19
Vermont	16,000	same	19
Nebraska	15,000	same	19
New Jersey	15,000	same	19
Rhode Island	15,000	same	19
Virginia	15,000	same	19
Georgia	15,000	same	19
Kearsarge	11,520	4 13-in. 4 8-in.	17
Kentucky	11,520	same	17
Maine	12,500	4 12-in.	18
Missouri	12,500	same	18
Ohio	12,500	same	18
Alabama	11,525	4 13-in.	17
Illinois	11,525	same	17
Wisconsin	11,525	same	17
Iowa	11,000	4 12-in.	17
Indiana	10,300	4 13-in. 8 8-in.	16
Oregon	10,300	same	16
Massachusetts	10,300	same	16

The war with Spain caused increased attention to be given to naval affairs, not only because the navy had done well, but because the people were beginning to appreciate the importance of a powerful navy to a country which must be attacked from the sea and reach its enemies through its naval strength. They learned not only this, but that true naval defense lies not in passive protection of harbors by forts and harbor-defense ships, but in pursuing the enemy's naval forces at sea and destroying them. The realization of these things caused the navy to be considerably expanded; more heavy battleships, armored cruisers, and torpedo boats were authorized; and the enlisted force, which had been nearly doubled since 1882, was now greatly increased. In 1899, for the first time in nearly 20 years, Congress passed legislation of importance concerning the officers. Nearly all corps were slightly increased, and the line and engineer corps were combined. This was practicable, as nearly all officers of both corps had been educated at the Naval Academy, and, while the line officers had received considerable instruction in steam engineering, the engineers had received some training in line officers' duties. After 17 years of experience the amalgamation of the two corps is regarded as highly successful and as adding greatly to the efficiency of the navy. Officers electing to perform special duties are selected for additional courses in their work—ordnance, marine engineering, electrical engineering, aviation, etc. The senior officers performing duties in these branches are, as far as practicable, selected from those who have been specially educated for the work.

Modern Establishment. The rapid development of the navy during the years following the Spanish War so increased the strength of the fleet that about 1904 the United States became the second naval power of the world. After 1906 the annual increase of the fleet was lessened, while that of Germany was increased, so that by 1910 Germany had risen to second place. A further reduction in the building programme of the United States caused her relative power to decline until in 1915 it was only on a par with that of France. A comparison of the number and tonnage of vessels built and building in the navies of the world on July 1, 1915, is given in the article on NAVIES.

The active list of officers of the navy on Jan. 1, 1916, consisted of 1 admiral of the navy, 25 rear admirals, 90 captains, 120 commanders, 203 lieutenant commanders, 351 lieutenants, 440 lieutenants (junior grade), 760 ensigns, 17 medical directors, 15 medical inspectors, 85 surgeons, 195 passed-assistant and assistant surgeons, 136 temporary assistant surgeons, 40 dental surgeons, 13 pay directors, 15 pay inspectors, 86 paymasters, 109 passed-assistant and assistant paymasters, 24 chaplains, 17 professors of mathematics, 51 naval constructors, 24 assistant naval constructors, 29 civil engineers, 11 assistant civil engineers, 102 chief boatswains, 89 boatswains, 101 chief gunners, 92 gunners, 147 chief machinists, 110 machinists, 79 chief carpenters, 47 carpenters, 1 chief sailmaker, 14 chief pharmacists, 11 pharmacists, and 912 midshipmen at the Naval Academy. The enlisted force consisted of 49,880 men. In the marine corps at that date there were 345 officers and 9920 men. For the pay of officers and men, see PAY AND ALLOWANCES.

The annual cost of the navy at different periods of its existence is shown in the following table.

YEAR	Expenditure	YEAR	Expenditure
1794	$61,409	‡1860	$11,514,650
1795	410,562	‡1861	12,387,157
*1798	1,381,347	‡1862	42,640,353
*1799	2,858,082	‡1863	63,261,235
1800	3,448,716	‡1863	85,704,964
1810	1,654,244	‡1865	122,617,434
†1812	3,959,365	1870	21,780,230
†1813	6,446,600	1875	21,497,626
†1814	7,311,291	1880	13,536,985
†1815	8,660,000	1885	16,021,080
1820	4,387,990	1890	22,006,206
1825	3,049,084	1895	28,797,796
1830	3,239,429	§1898	58,823,985
1835	3,864,939	§1899	63,942,104
1840	6,113,897	§1900	55,953,078
1845	6,297,178	1906	110,474,264
1850	7,904,725	1910	123,173,717
1855	13,327,095	‖1916	149,661,865

* War with Barbary states. † War of 1812.
‡ Civil War. § Spanish-American War.
‖ Amount appropriated.

The number and tonnage of each class of the less important vessels (built and building) will be found in the table under NAVIES.

For additional information, see MERCHANT MARINE; NAVAL ACADEMY; NAVAL AËRONAUTICS; NAVAL RESERVE; NAVAL SCHOOLS OF INSTRUCTION; NAVIES; NAVY, DEPARTMENT OF THE; NAVY YARD; PAY AND ALLOWANCES; SHIP AND SHIPPING; SHIP, ARMORED.

Colonies. The following figures for area and population are based upon the census of 1910 and government estimates.

COLONIES	Area	Population
Hawaii	6,449	191,909
Philippine Islands (1903)	115,026	7,635,426
Porto Rico (1899)	3,435	1,118,012
Guam (est.)	210	9,000
Tutuila (est.)	77	6,100
Panama Canal Zone (est.)	436	50,000
Total for the colonies	125,633	9,010,447

For details on commerce, government, history, etc., see HAWAII; PHILIPPINE ISLANDS; PORTO RICO; ETC.

POPULATION

The population of the United States has grown from 3,929,214 in 1790 to over 100,000,000 in 1916. It constitutes over one-half that of the Western Hemisphere and greatly exceeds that of any European country except Russia. The rapidity of the growth of the population is without parallel among civilized nations. In 1900 it was over 14 times as great as in 1800. During the same period the population of the United Kingdom and the German Empire increased about one and one-half times each, while that of France increased by less than half. The growth of the population also has been remarkably steady. Except in the war decade (1860–70), the increase in each decade since 1790 has been greater than in the decade preceding.

The following table shows the growth of the population by sections—the North as compared with the South and the East with the West.

CENSUS	POPULATION				
	North Atlantic and North Central divisions	South Atlantic and South Central divisions	East of the Mississippi river	West of the Mississippi river	Total *
1910	56,156,667	29,389,330	65,690,672	26,281,594	91,972,266
1900	47,379,699	24,523,527	55,023,513	20,971,062	75,994,575
1890	39,763,824	19,830,813	46,160,075	16,462,175	62,947,714
1880	31,871,518	16,516,568	38,896,423	11,259,360	50,155,783
1860	19,690,984	11,133,361	26,906,846	4,536,475	31,443,321
1840	10,112,624	6,950,729	16,186,554	876,799	17,069,453
1820	5,219,221	4,419,232	9,404,187	234,266	9,638,483
1800	2,686,582	2,621,901	5,308,483	....	5,308,483
1790	1,968,040	1,961,174	3,929,214	....	3,929,214

* Exclusive of Alaska and the insular possessions.

It will be seen that the North has, until recent years, grown much more rapidly in population than the South. The more rapid growth of the South in the last decade was largely due to the development in the Southwest. The gain in the region east of the Mississippi has been remarkably regular. The percentage of gain west of the Mississippi was formerly enormous, but is rapidly falling to that of the region east of the Mississippi.

Estimates of the population prior to the first regular census place the figure at 200,000 in 1688 and 1,850,000 in 1770. At the time of the first census the population was almost wholly confined to the Atlantic coast region, the five most populous States being Virginia, Pennsylvania, North Carolina, Massachusetts, and New York, in the order named. The growth of the population has been due in a considerable degree to the additions by immigration. The number of persons entering the United States from foreign countries with the purpose of a permanent residence there aggregates over 33,000,000. The official record of immigration only began in 1820 and during the period 1886–95 did not include the immigrants from Mexico or Canada, but the official figures from 1820 to 1916 show a total of slightly more than 33,000,000. Of this total to the end of 1914 the number from Germany was 5,519,460, Austria-Hungary 4,047,717, Ireland 4,331,190, England 3,261,532, Italy 3,979,425, Russia 3,383,717. These immigrants have distributed themselves over the country, aiding in its development by their participation in agriculture, mining, manufactures, transportation, and the industries and business of the cities and towns.

POPULATION BY STATES 1850 TO 1910

STATES	Land area sq. mi.	Pop. 1850	Pop. 1890 *	Pop. 1900 †	Pop. 1910	Negroes 1910	Foreign-born 1910
North Atlantic Division:							
Maine	29,895	583,169	661,086	694,466	742,371	1,363	110,562
New Hampshire	9,031	317,976	376,530	411,588	430,572	564	96,667
Vermont	9,124	314,120	332,422	343,641	355,956	1,621	49,921
Massachusetts	8,039	994,514	2,238,943	2,805,346	3,366,416	38,055	1,059,245
Rhode Island	1,067	147,545	345,506	428,556	542,610	9,529	179,141
Connecticut	4,820	370,792	746,258	908,420	1,114,756	15,174	329,574
New York	47,654	3,097,394	5,997,853	7,268,894	9,113,614	134,191	2,748,011
New Jersey	7,514	489,555	1,444,933	1,883,669	2,537,167	89,760	660,788
Pennsylvania	44,832	2,311,786	5,258,014	6,302,111	7,665,111	193,919	1,442,374
Total North Atlantic Division	161,976	8,626,851	17,401,545	21,046,695	25,868,575	484,176	7,676,283
South Atlantic Division:							
Delaware	1,965	91,532	168,493	184,735	202,322	31,181	17,492
Maryland	9,941	583,034	1,042,390	1,188,044	1,295,346	232,250	104,944
District of Columbia	60	51,687	230,392	278,718	331,069	94,446	24,902
Virginia	40,262	1,421,661	1,655,980	1,854,184	2,061,612	671,096	27,057
West Virginia	24,022	....	762,794	958,800	1,221,119	64,173	57,218
North Carolina	48,740	869,039	1,617,947	1,893,810	2,206,287	697,843	6,092
South Carolina	30,495	668,507	1,151,149	1,340,316	1,515,400	835,843	6,179
Georgia	58,725	906,185	1,837,353	2,216,331	2,609,121	1,176,187	15,477
Florida	54,861	87,445	391,422	528,542	752,619	308,699	40,633
Total South Atlantic Division	269,071	4,679,090	8,857,920	10,443,480	12,194,965	4,801,721	299,994
North Central Division:							
Ohio	40,740	1,980,329	3,672,316	4,157,545	4,767,121	111,452	598,374
Indiana	35,885	988,416	2,192,404	2,516,462	2,700,826	60,320	159,663
Illinois	56,002	851,470	3,826,351	4,821,550	5,638,191	100,049	1,205,314
Michigan	57,480	397,654	2,093,889	2,420,982	2,810,173	17,115	597,550
Wisconsin	55,256	305,391	1,686,880	2,069,042	2,333,860	2,900	512,865
Minnesota	80,858	6,077	1,301,826	1,751,394	2,075,708	7,084	543,195
Iowa	55,586	192,214	1,911,896	2,231,853	2,224,771	14,973	273,765
Missouri	68,727	682,044	2,679,184	3,106,665	3,293,335	157,052	229,779
North Dakota	70,183	....	182,719	319,146	577,056	617	156,654
South Dakota	76,868	....	328,808	401,570	583,888	817	100,790
Nebraska	76,808	....	1,058,910	1,066,300	1,192,214	7,689	176,662
Kansas	81,774	....	1,427,096	1,470,495	1,090,949	54,030	135,450
Total North Central Division	756,167	5,403,595	22,362,279	26,333,004	30,288,092	534,081	4,690,061
South Central Division:							
Kentucky	40,181	982,405	1,858,635	2,147,174	2,289,905	261,656	40,162
Tennessee	41,687	1,002,717	1,767,518	2,020,616	2,184,789	473,088	18,607
Alabama	51,279	771,623	1,513,017	1,828,697	2,138,023	908,282	19,286
Mississippi	46,362	606,526	1,289,600	1,551,270	1,797,114	1,009,487	9,770
Louisiana	45,409	517,762	1,118,587	1,381,625	1,656,388	713,874	52,765
Texas	262,398	212,592	2,235,523	3,048,710	3,896,542	690,049	241,938
Indian Territory	30,790	....	180,182	392,060	....	....	......
Oklahoma	3,824	....	61,834	398,331	1,657,155	137,612	40,442
Arkansas	52,525	209,897	1,128,179	1,311,564	1,574,449	442,891	17,046
Total South Central Division	609,255	4,303,522	11,153,075	14,080,047	17,194,365	4,636,919	440,017
Western Division:							
Montana	145,776	....	132,159	243,329	376,053	1,834	94,713
Wyoming	97,594	....	60,705	92,531	145,965	2,235	29,029
Colorado	103,658	....	412,198	539,700	799,024	11,453	129,587
New Mexico	122,503	61,547	153,593	195,310	327,301	1,628	23,146
Arizona	113,840	....	59,620	122,931	204,354	2,009	48,765
Utah	82,184	11,380	207,905	276,749	373,351	1,144	65,822
Nevada	109,821	....	45,761	42,335	81,875	513	19,691
Idaho	83,779	....	84,385	161,772	325,594	651	42,578
Washington	66,836	....	349,390	518,103	1,141,990	6,058	256,241
Oregon	95,607	13,294	313,767	413,536	672,765	1,492	113,136
California	156,092	92,597	1,208,130	1,485,053	2,377,549	21,645	586,432
Total Western Division	1,177,690	178,818	3,027,613	4,091,349	5,983,831	50,662	1,409,140
Total United States (proper)	2,974,159	23,191,876	62,802,432	75,994,575	91,972,266	....	....
Alaska	590,884	....	....	63,592	64,366	....	....
Colonies	125,671	....	....	8,757,770	9,010,447	....	....
Grand total	3,690,714	....	....	84,815,937	‡101,100,000	....	....

* 1890 figures include Indians in the Indian Territory, but not those on other reservations.
† 1900 figures do not include 91,219 persons in military and naval service.
‡ Figures include about 56,000 persons in military and naval service abroad.

Interstate Migration. In the early period of migration the direction of the movement was determined largely by the opportunities afforded by waterways and mountain passes and later by the railroad accommodations. The waterway system of the United States was admirably adapted to aid in the settlement, and the part it played is not easily overemphasized. Not only did many of the early settlers secure transportation to their new homes by rivers, but they used the rivers also as avenues of commerce, and new settlements almost universally began along watercourses. In the North the immigrants from New England and New York passed almost wholly through the Mohawk valley, and western New York developed rapidly along the line of the Erie Canal. By this route the Lake region and the Northwest in general were peopled. Farther to the south a large number of settlers found passage west by way of the valley of the Potomac and by the Ohio and its tributaries. The settlements made in the region tributary to the Ohio were first to the south and later to the north of that stream. In the Southeast the Savannah and other rivers in like manner aided in opening up the interior region. The influence of streams in the Mississippi valley was very marked. Through the main stream from the south, and through the Ohio from the east, large numbers of immigrants passed to the centre of the valley and thus were enabled to reach other regions watered by the Mississippi system, until settlements lined the main and tributary streams. The railroads came at an opportune time and made possible and profitable the settlement of regions that would otherwise have remained unsettled for a much longer time. The gold discoveries in California drew large numbers of immigrants in spite of the difficulties of the route, but, generally speaking, the Pacific coast and the Cordilleran region awaited the construction of railroads. The movement of the population in the United States has been in the main westward, following the parallels of latitude. Almost every newly settled region, however, received representatives from all parts of the older settled regions, and there are a few very marked north and south movements. Thus, e.g., southern and central Indiana were filled largely with immigrants from North Carolina, Kentucky, and other Southern States. The early lead miners and settlers in the adjacent corners of Wisconsin and Illinois on the Mississippi were Southerners. The recently settled Oklahoma and Indian Territory received large numbers from both the North and the South. As the West became well settled, the westward movement grew less important; in 1880, 11 per cent of the population of the Central States were born in the Atlantic Coast States, in 1900 only 6 per cent of the population in the former group of States were born in the latter group. Again, in 1880, 13.5 per cent of the population of the western division of States were born in the Atlantic States; in 1900 the corresponding per cent was only 9.5. The absolute number, however, had increased during the period. The increase was much more marked in the percentage of the Central States population which the western division of States contained. In 1910 no less than 19 per cent of the natives of New York State were residing in other States, while 11 per cent of the native population of New York were born in other States of the Union. The migratory movement is still more perceptible in those born in the Middle West. The census of 1910 showed that over 27 per cent of the persons born in Ohio and Indiana were living in other States, while of those born in Iowa and Kansas over 34 per cent were living in other States. The disposition to migrate is less perceptible in the South than in the North. In the Southern States, in 1910, 80 per cent of the population were born in the State of residence, while in the remainder of the country only 51 per cent of the native population were born in the State of residence.

Negro Population. See NEGRO IN AMERICA.

Urban Population. Since 1875 there has developed a marked tendency for the population of the United States to congregate in cities. Better transportation and communication facilities have enabled trade to concentrate in the large centres, and the development of an extensive factory system has also tended in the same direction. At the same time the greater use of farm machinery has reduced the amount of labor necessary on the farm. In 1890, 36 per cent of the population of the country were classed as urban, which term includes all those living in cities and other incorporated places having a population of 2500 or over. In 1900, 40 per cent of the population were classed as urban, and in 1910, 46 per cent. In the New England States 83 per cent were urban, Middle Atlantic 71, East North Central 58, South Atlantic 25, and East South Central 19 per cent. In the Pacific coast States 54 per cent were classed as urban.

The following table shows the population of the 20 largest cities in 1910, for the census years 1860, 1900, 1910, and as estimated for 1915.

POPULATION

CITY	1915	1910	1900	1860
New York, N. Y. . .	*5,047,221	4,766,883	3,437,202	813,669
Chicago, Ill.	2,447,045	2,185,283	1,698,575	109,260
Philadelphia, Pa. . .	1,683,664	1,549,008	1,293,697	565,529
St. Louis, Mo.	745,988	687,029	575,238	160,773
Boston, Mass.	*745,439	670,585	560,892	177,840
Cleveland, Ohio . . .	656,975	560,663	381,768	43,417
Baltimore, Md.	584,605	558,485	508,957	212,418
Pittsburgh, Pa.	571,984	533,905	451,512	49,221
Detroit, Mich.	554,717	465,766	285,704	45,619
Buffalo, N. Y.	*454,630	423,715	352,387	81,129
San Francisco, Cal.	†448,502	416,912	342,782	56,802
Milwaukee, Wis. . . .	428,062	373,857	285,315	45,246
Cincinnati, Ohio . . .	406,706	363,591	325,902	161,044
Newark, N. J.	*366,721	347,469	246,070	71,941
New Orleans, La. . .	366,484	339,075	287,104	168,675
Washington, D. C. .	358,611	331,069	278,718	61,122
Los Angeles, Cal. . .	475,367	319,198	102,479	4,385
Minneapolis, Minn.	353,460	301,408	202,718	2,564
Jersey City, N. J. . .	*270,903	267,779	206,433	29,226
Seattle, Wash.	330,834	237,194	80,671	. . . . . .

* State census. † 1914 est.

Density. In 1910 there were 31 persons to the square mile in the United States as against about 400 persons in Great Britain, 320 persons in Germany, and 191 in France. The average density of population in United States is low because of the vast uninhabited areas in the Western section. In some sections, such as Massachusetts, or New Jersey, the density compares favorably with that of western European countries. The number per square mile in 1910 was in Rhode Island 509, Massachusetts 419, New Jersey 338, Connecticut 231, New York 191, Pennsylvania 171, Ohio 117, Illinois 101.

Sex. The population contrasts with that of most European countries in that the males outnumber the females. The excess is greatly increased because of the greater number of male than of female immigrants.

In the North Atlantic and the South Atlantic States the sexes are almost equal in number. In some of these States, such as Massachusetts, the females are much in excess of the males, amounting in the State named to 51.3 per cent of the total population. This is in part due to the large immigration of girls for work in the factories of that State and in part to the emigration of men to the West. There is no State in the other divisions of States in which the females are equal in number to the males, and in the three States Montana, Wyoming, and Nevada the females are less than 40 per cent of the total, while in Alaska they constitute but about 30 per cent of the total population. The following table shows the proportion of the sexes by nativity and color in 1910.

NATIVITY AND COLOR, 1910	Males	Females
Native white, native parents	25,229,218	24,259,257
Native white, foreign parents	9,425,239	9,472,198
Foreign white	7,523,788	5,821,757
Negro	4,885,881	4,941,882
Chinese	66,856	4,675
Japanese	3,070	9,087
Total	47,322,077	44,639,989

Occupations. The agricultural industry still continues well in the lead with respect to the number of persons engaged. There has been, however, a marked relative decrease since 1880, as will be seen in the table below. In the period 1880–1900 there was a larger absolute gain in the number engaged in trade and transportation and in manufacturing and mechanical pursuits respectively than there was in agriculture. The increase in trade and transportation has been especially noteworthy. The number of females engaged in occupations more than doubled in the 20-year period. The percentage of females engaged in domestic personal service decreased, while there was a large gain in the percentage engaged in trade and transportation. The preceding table shows the number of persons in the different occupations (1880–1910).

CLASSIFICATION	MAINLAND		
	1910 Number	1900 Number	1880 Number
Both sexes; all occupations	38,167,336	29,074,117	17,392,099
Agricultural pursuits and forestry	12,659,203	10,381,765	7,713,875
Professional service	1,663,569	1,258,739	603,202
Domestic and personal service	3,772,174	5,580,657	3,423,815
Trade and transportation	6,252,341	4,766,964	1,866,481
Manufacturing and mechanical pursuits	10,658,881	7,085,992	3,784,726
Males; all occupations	30,091,564	23,754,205	14,744,942
Agricultural pursuits and forestry	10,851,702	9,404,429	7,119,365
Professional service	929,684	828,163	425,947
Domestic and personal service	1,241,328	3,485,208	2,242,309
Trade and transportation	5,677,357	4,263,617	1,803,629
Manufacturing and mechanical pursuits	8,837,901	5,772,788	3,153,692
Females; all occupations	8,075,772	5,319,912	2,647,157
Agricultural pursuits and forestry	1,807,501	977,336	594,510
Professional service	733,885	430,576	177,255
Domestic and personal service	2,530,846	2,095,449	1,181,506
Trade and transportation	574,684	503,347	62,852
Manufacturing and mechanical pursuits	1,820,980	1,313,204	631,034

Language. In 1900 there were 1,403,212 persons over 10 years of age who could not speak English, considerably over half of them being females. The majority (1,217,280) belonged to the census group "foreign white," constituting 12.2 per cent of the total number of persons in this class. Only 0.6 per cent of the native whites of foreign parents could not speak English. There were 38.2 per cent of the Chinese, 61.6 per cent of the Japanese, and 42.3 per cent of the Indians who could not speak English.

Immigration. For a general discussion of immigration and its problems, see IMMIGRATION.

The number of immigrants in 1914 was 1,218,480, being larger than in any previous year with the exception of 1907, when the total was 1,285,349. Italy, Russia, and Austria-Hungary contributed more than three-fourths of the total.

The following table shows the total number of immigrants and aliens, and the countries from which they came during the year 1914.

COUNTRY	IMMIGRANTS	ALIENS	TOTAL
Austria	134,831	6,690	141,521
Hungary	143,321	1,217	144,538
Belgium	5,763	838	6,601
Bulgaria, Servia, and Montenegro	9,189	1,348	10,537
Denmark	6,262	231	6,493
France, including Corsica	9,296	2,342	11,638
German Empire	35,734	4,196	39,930
Greece	35,382	751	36,583
Italy, including Sicily and Sardinia	283,738	10,951	294,689
Netherlands	6,321	735	7,056
Norway	8,329	1,344	9,673
Portugal, including Cape Verde and Asore Islands	10,898	53	10,951
Rumania	4,032	165	4,197
Russian Empire and Finland	255,660	6,749	262,409
Spain, including Canary and Balearic Islands	7,591	1,956	9,547
Sweden	14,800	471	15,271
Switzerland	4,211	320	4,531
Turkey in Europe	8,199	135	8,334
United Kingdom:			
England	35,864	11,648	47,512
Ireland	24,688	844	25,532
Scotland	10,682	1,725	12,407
Wales	2,183	350	2,533
Other Europe	967	48	1,015
Total Europe	1,058,391	55,107	1,113,498
China	2,502	343	2,845
Japan	8,929	330	9,259
India	221	148	369
Turkey in Asia	21,716	266	21,982
Other Asia	905	61	966
Total Asia	34,273	1,148	35,421
Africa	1,539	233	1,772
Australia, Tasmania, and New Zealand	1,336	1,796	3,132
Pacific Islands (not specified)	110	254	364
British North America	86,139	15,459	101,598
Central America	1,622	1,966	3,588
Mexico	14,614	2,410	17,024
South America	5,869	2,087	7,956
West Indies	14,451	9,052	23,503
United States	....	94,957	94,957
Other countries	136	132	268
Grand total	1,218,480	184,601	1,403,081

Religion. *The Colonial Period.*—The religious life of the United States has been profoundly affected by the fact that the period of the early settlement of the continent coincided with the great religious struggles in Europe of the seventeenth century. It was the reform within the Roman Catholic church, following the great Protestant schism, that started the orders of that church on their proselyting crusades, which from New Spain in the southwest and New France in the north extended into territory now embraced within the United States. The divisions among the Protestants themselves resulted in the planting of most of the English Colonies and determined that their future development should be along the line of multiplicity of sects with extreme local independence. Puritanism, within and without the Established church, was the prevailing influence among these colonists. In Virginia its influence was overthrown soon after the Cavalier immigration of the Cromwellian era. Maryland, settled under Roman Catholic leadership, always retained a dominant Puritan element in its population. The same was true of the Carolinas and later of Georgia, although, as in almost all the Southern Colonies, the official class belonged to the Church of England. In New England for more than half a century the Puritans, outside of Rhode Island, constituted a veritable theocracy. Those settlers who passed from New England to the other Colonies usually bore with them a modified form of Puritanism, which reappeared in the early Presbyterian development of the Middle Colonies and in the Baptist development farther South. The religious influence of the early Dutch settlers of New York was never very strong, and before the Colony passed into English control it was known as a most mixed sectarian centre. In New Jersey and Pennsylvania the Quaker element, although early abdicating political control, continued to be the leading social factor.

Throughout the Colonial period the Congregational churches exercised almost undisputed religious sway in New England, while members of the Established church nominally did the same for the Southern Colonies. In the Middle Colonies no one sect acquired a hegemony. Here the diversified English sects were quickly joined by Huguenots from France, Palatines, Salzburgers, and Moravians from Germany, Covenanters from Scotland, and the Scotch-Irish Presbyterians. To a much more limited extent many of these immigrants settled in the Carolinas and Georgia, but their chief irruption into the South was by the way of the Appalachian highlands. In this early sectarian diversity the Middle Colonies, more than those of any other section, were most typical of the succeeding development of the whole country. During the first century and a quarter of settlement there was naturally little of common religious experiences in the Colonies. Some conscientious attempts were made to convert the Indians, of which the most important was the work of the President and Society for the Propagation of the Gospel in New England. The Society for the Propagation of the Gospel in Foreign Parts, a Church of England organization, founded in 1701, did an important work in the Middle and Southern Colonies. The most important religious experience of the eighteenth century was the Great Awakening, centring about 1740, which profoundly affected all of the Colonies, led to an extension of church building, the founding of Princeton College as the result of a great Presbyterian development in the Middle Colonies, and the firm establishment of Baptist preëminence in the South. Because of some unwise practices not wholly avoidable, dissensions were introduced among the existing sects, yet the movement as a whole was most beneficial, not merely because it stamped upon American church life a strong evangelistic and missionary character, but because it led the way to the later establishment of full religious toleration. The later part of the Colonial period was characterized by the rapid development of Presbyterianism, the formal establishment of the Reformed and Lutheran churches among the Germans, and the beginning of Methodism—all within the Middle and Southern Colonies. See CONGREGATIONALISM.

The National Period.—The Revolutionary War, although it ushered in an era of complete religious toleration, so far as State and nation were concerned, was not on the whole favorable to the development of the religious life of the newly created States. At the end of the century, when spiritual conditions were at their lowest ebb, the country experienced a second great revival, which if it lacked some of the fervid manifestations of the first, was much more productive of lasting results. As in the former case there came about a secession of some of the more radical elements from the existing denominations in the Middle States and the South, and the severance of the Unitarians and Universalists from the Congregational church in New England. Yet in the main the first three decades of the nineteenth century may be termed the era of good feeling in a religious as well as a political sense. It was a period of great catholicity among the various denominations, with coöperation in foreign and home missionary work, in educational advancement, and in the work of Bible distribution. This was the period also when the Episcopal and Catholic churches began to develop along American lines and to assume an important position among American denominations; the latter being recruited most largely from foreign immigration, and the former from the other denominations. The great missionary movement towards foreign lands, the home missionary movement along the Western national border, the building of theological seminaries, the work among the negroes and Indians, protests against slavery, and the first movements in favor of total abstinence also date from this period. Early in the nineteenth century the connection between church and state in New England was completely severed.

The next 30 years (1830–60) were characterized by a more intense denominational alignment, showing itself in a withdrawal of the separate churches from organizations for united effort and in the creation of various denominational boards to carry on this work; in a new zeal for Church history along sectarian lines; in a general Protestant antipathy to the Roman Catholic church, which even displayed itself in the political world (see KNOW-NOTHING), and in the division of some of the great denominations along sectional lines, especially over the great slavery question. The religious element was especially helpful on both sides during the Civil War and was much in evidence in the organization of associations for the care of soldiers at the front and also at the North for the education of the freedmen.

An important revival just preceding the Civil War had stirred deeply the evangelical sentiment of all the churches, and this was quickened by a succeeding revival between 1870 and 1880.

The influence of these movements has been to increase a sincere and hearty coöperation of all denominations in fundamental religious work. There has been a distinct advance in essential Christian union expressed in the federation of a large number of the Protestant denominations. This tendency has been much strengthened by such organizations as the Evangelical Association, the Young Men's Christian Association, and the various young people's organizations. (See Christian Endeavor; Epworth League; Young Men's Christian Association.) An interesting feature of the religious development of the last half century has been the growth of certain nonorthodox sects. See Christian Science; Mormons; New Thought.

Owing to the fact that church and state are entirely distinct in the United States, it is difficult to obtain accurate information concerning religious statistics. The only figures available are those derived from the annuals and yearbooks published by the several denominations. The accompanying table presents figures for the principal denominations from the United States Bureau of the Census Bulletin of Church Statistics, 1915. Many of the items are estimated, and some represent heads of families only.

DENOMINATIONS	Ministers	Churches	Communicants
Adventists	1,169	2,579	98,927
Baptists	42,710	57,537	6,179,622
Brethren, Dunkards	3,433	1,289	121,476
Brethren, Plymouth	...	403	10,566
Brethren, River	224	105	4,903
Buddhists	15	74	3,165
Catholic, Apostolic	33	24	4,927
Catholic, Eastern	341	401	462,500
Catholic, Western	19,029	15,002	13,881,413
Christians	1,066	1,360	113,887
Christian Science Church	2,672	1,336	85,096
Christian Union	354	302	15,217
Church of God, Winebrennian	509	595	41,475
Church of the New Jerusalem	143	147	9,671
Congregationalists	5,923	6,093	763,182
Disciples of Christ	14,184	17,236	2,283,003
Evangelical bodies	1,569	2,598	194,535
Friends	1,471	1,042	122,004
German Evangelical Protestant	59	66	34,704
German Evangelical Synod	1,058	1,365	290,803
Jewish Congregations	1,084	1,769	143,000
Latter-Day Saints	3,800	1,625	375,000
Lutheran	9,450	16,220	2,444,970
Scandinavian Evangelical	629	857	72,900
Mennonites	1,413	736	57,337
Methodists	41,925	62,416	7,328,829
Moravians	147	143	20,615
Pentecostal bodies	820	728	23,946
Presbyterians	14,066	16,834	2,083,617
Protestant Episcopal	5,629	8,002	1,026,048
Reformed	2,177	2,770	478,951
Salvationists	2,967	924	27,893
Spiritualists	....	2,100	200,000
Theosophical Society	....	154	4,714
United Brethren	2,260	4,086	343,016
Unitarians	524	475	70,542
Universalists	650	717	52,000
Independent Congregations	267	879	48,673

Education. This subject will be found fully under the following titles: Common Schools; Curriculum; Education; Grammar Schools; Kindergarten; Manual Training; National Education, Systems of; Normal Schools; Parochial Schools; Pedagogy; Physical Education; Public Schools; Schools; Schools, Medical Inspection of; Teachers' Pensions; Teachers' Salaries; Evening Schools; Vacation Schools; High Schools; Elective Courses and Studies; Colleges, American; University; University Extension; Vocational Education; Education, Commercial; Technical Education; Legal Education; Medical Education; Mental Defectives; Blind, Education of the; Deaf-Mute, *Methods of Instruction;* Negro Education; Education, Commissioner of; Education Association, National; Education, Colonial.

Educational Statistics.—Statistics bearing on the separate topics included in the general field of education are given in the articles dealing with them. The total enrollment of pupils in elementary schools (including kindergartens) in 1913 was 19,064,787 (17,474,269 in public and 1,590,518 in private schools). The pupils in the public schools were taught by 511,745 teachers (89,801 men and 421,944 women) and in private schools by 41,831 teachers (23,412 men and 30,326 women). The average number of days the schools were kept open during the year was 158.1. The total estimated expenditure for the public schools was $457,386,423, or a per capita cost of $26.17, and for the private schools, $50,896,576, or a per capita cost of $32. The average annual salaries of all teachers was $511.86; the average monthly salary for men was $78.29 and for women, $61.31.

The total enrollment in high schools and academies was 1,283,009 (1,134,771 in public and 148,238 in private high schools). The public high schools employed 53,738 teachers (23,412 men and 30,326 women), while there were in private schools 13,354 teachers (5656 men and 7698 women). The total estimated expenditure for the public schools was $64,159,952, or a per capita cost of $56.54, and for the private schools $13,949,196, or a per capita cost of $94.10.

The number of students in universities and colleges was 201,230 (79,178 in public institutions and 122,052 in private). The enrollment in professional schools was 65,585 (11,438 in public and 54,149 in private schools). The total expenditure was $89,535,110, or a per capita cost of $335.57. The total number of instructors of different ranks in the 567 institutions reporting to the United States Bureau of Education was 31,312 (25,389 men and 5923 women).

During this year (1913) 94,455 students were enrolled in the normal schools (87,172 in public and 7283 in private schools). The total cost of these schools was $14,956,005, or a per capita cost of $158.34.

Including all types of instruction in addition to the above, such as city evening schools, schools for different types of defectives (physical and mental), orphan asylums, schools in Alaska, etc., there were enrolled 21,632,513 pupils (19,352,059 in public and 2,279,554 in private institutions), requiring a total expenditure of $749,736,864, or a per capita cost of $35.31.

Charities. The national government has no department concerned directly with charities, their control being in the hands of the State and municipal governments. Many private organizations and societies are also interested in the subject. See under the several State articles; also Charities; Pauperism; Charities and Correction, *The National Conference of;* Charity Organization Society; etc.

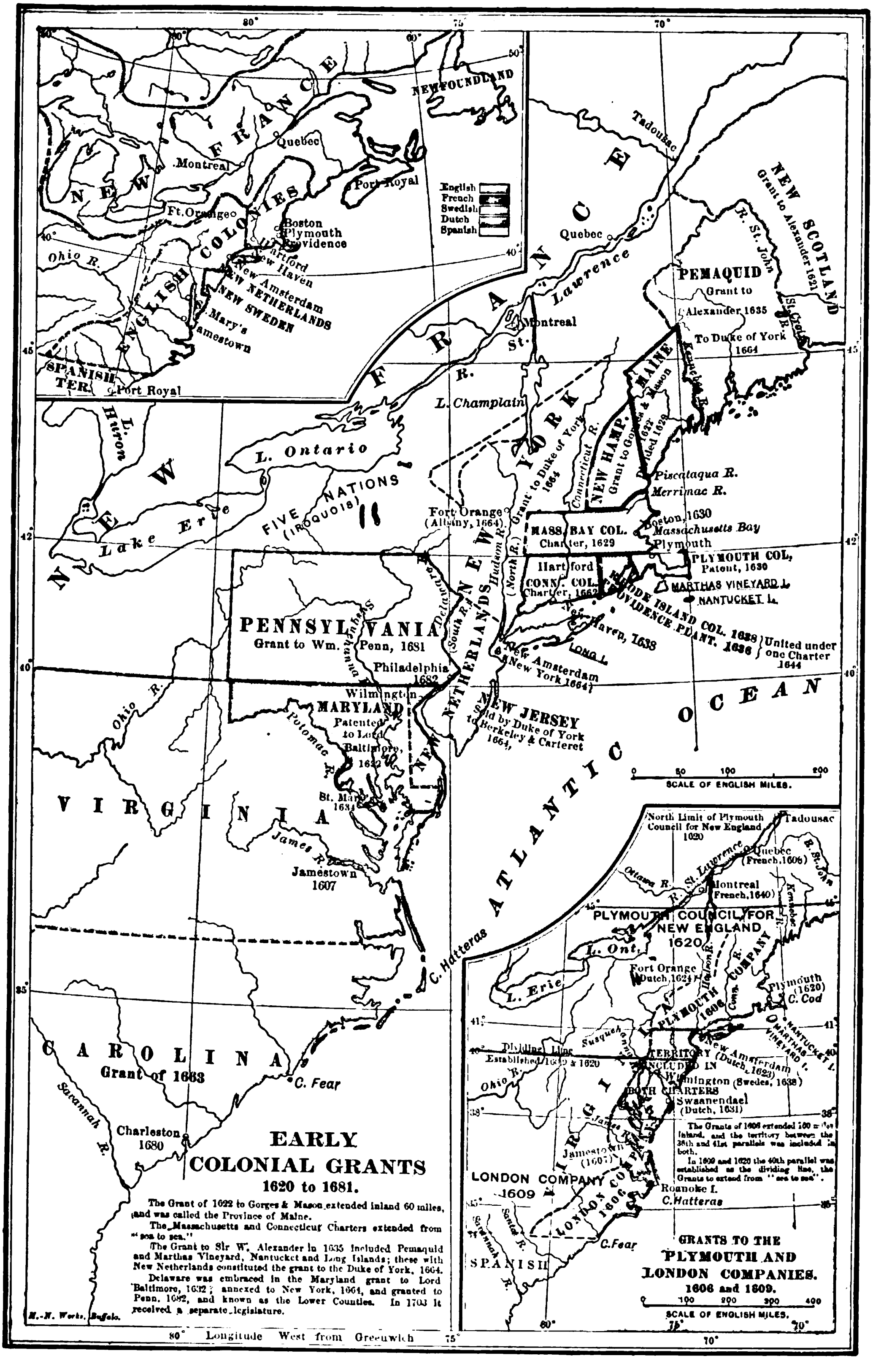
HISTORY

Colonial Period. The territory included within the United States of America was originally occupied solely by numerous tribes of Indians. The northeast coast was probably visited about the year 1000 A.D. and subsequently by the Northmen (see VINLAND), and other navigators may in the following five centuries have sighted parts of the coast; but the existence of the American continent was unknown to the world at large until after Columbus' discovery in 1492. In 1497 John Cabot reached the coast of America, probably in the neighborhood of Cape Breton. The Portuguese Cortereal explored the coast southward from the Gulf of St. Lawrence in 1500–01, and probably from as early a date as 1504 fishermen from Normandy and Brittany frequented the shores of Newfoundland. In 1513 Juan Ponce de León explored a portion of Florida in a romantic search for the fountain of youth; and in 1520 some Spanish vessels from Santo Domingo were driven upon the coast of Carolina. During the following year, through the conquests of Cortés (q.v.) and his followers, Mexico, including the territory later known as Texas, New Mexico, and California, became a province of Spain. In the same decade Verrazano explored the coast between North Carolina and Newfoundland and Narváez made his disastrous expedition to Florida. Ferdinand de Soto in 1539–42 led a Spanish expedition from the coast of Florida westward, discovering the Mississippi River early in 1541. Simultaneously with this expedition Coronado's men explored a great part of what is now southwest United States. A Spanish settlement was made at St. Augustine, Fla., in 1565, and in 1585 Sir Walter Raleigh (q.v.) sent out a Colony which settled on Roanoke Island. None of the settlements attempted during the sixteenth century, however, except St. Augustine, had any permanence; and it was not until the seventeenth century that the Europeans, and especially the English, devoted their enterprises to colonization rather than to exploration. King James in 1606 granted a charter to two joint-stock companies, the London Company (q.v.) and the Plymouth Company (q.v.). The London Company in 1607 founded Jamestown, Va., the first permanent English settlement within the limits of the present United States. Here in 1619 a representative assembly was called, the first in the New World. In 1607, also, the Plymouth Company sent out an expedition to the Kennebec, where the settlers experienced a severe winter, and in 1608 abandoned the undertaking. In 1620 a body of Puritan Separatists who had secured a grant from the London Company landed by mistake farther northward and settled Plymouth. Between these two Colonies the Dutch had already established themselves (1613) at New Amsterdam. Quebec was settled in 1608, and a large part of the country on the Great Lakes and on the Mississippi was explored by Nicolet (1634), by Marquette and Joliet (1673), and by La Salle (1682), and settlements were early made by the French at the outposts of Kaskaskia and Arkansas Post and at Mobile and Vincennes. Thus the beginnings were made of two distinct movements of the incoming population, in the course of one of which the English were to occupy practically the entire Atlantic seaboard of the present United States, excluding Florida, while in the course of the other the French were to establish themselves at strategic points on the two great waterways. The colonizing work of the French was such as to make conspicuous the trading post, the military element, and the bureaucratic class, and to minimize the features of public development, of local political life, and of permanence in method and purpose. The English, on the other hand, brought with them their school, their church, and their political forms, and founded Colonies on lines which were adhered to throughout their later development. (The early history of the various Colonies, the union of which formed the United States, will be found under the heads of the different States.) In some of the Colonies representative governments were maintained, in which all officers, both executive and judicial, as well as the entire Legislature, were chosen by the people. On the other hand, in the royal provinces, such as Virginia and New York, the chief judicial and executive officers, as well as members of the upper branch of the Legislature, were appointees of the crown, the general population sharing in the provincial government only through the choice of the members of the Legislature. This distribution of privilege characterized also the proprietary provinces, such as Maryland, in which, however, appointments were made by the proprietors instead of by the crown. Thus in the royal and proprietary provinces the ultimate authority was outside of the province, while in corporate Colonies all authority apparently was within each province, and there was in the scheme by which these provinces were organized no effective means of subordinating their political actions to the power of the central administration except through the alteration or abolition of their charters.

Originally nearly all the Colonies were proprietary, and while the crown subsequently sought pretexts for making them all royal provinces the people in both the proprietary and royal provinces sought to increase their power by gaining control of the public purse through annual and specific appropriations.

During the Colonial period there were several instances of the tendency of the Colonies, having very similar institutions and ideals, to act jointly as a confederate body. The first instance of a limited union of Colonies was in 1643, when Massachusetts Bay, Plymouth, Connecticut, and New Haven formed, under the title of the United Colonies of New England, a confederacy, which existed for nearly 40 years, for mutual defense against the French, Dutch, and Indians. There was also some united action during the early Indian wars, and at the beginning of the French and Indian War (q.v.), in 1754, the Colonies being strongly advised by the Lords of Trade to unite for general defense, a formal plan for a permanent general government of all the English Colonies was drawn up by Benjamin Franklin (q.v.) and presented at the Albany Convention (q.v.); but it was rejected by both the Colonies and the crown.

Although the several Colonies were at no time organically connected, except through the King, the basis for union was early laid in the establishment of local governments in which the controlling principles were similar. There appeared also a substantial identity in forms and in practices of local government. This made it natural that occasionally during the Colonial period there should appear marked tendencies towards union. In some respects, however, different types of population distinguished the several portions of settled territory, a fact due in some measure to the various classes of people in England from which the immigrants came. Thus during the period between 1620 and 1640 large numbers of dissenters withdrew from England,



EARLY COLONIAL GRANTS

1620 to 1681.

The Grant of 1622 to Gorges & Mason extended inland 60 miles, and was called the Province of Maine.

The Massachusetts and Connecticut Charters extended from "sea to sea."

The Grant to Sir W. Alexander in 1635 included Pemaquid and Marthas Vineyard, Nantucket and Long Islands; these with New Netherlands constituted the grant to the Duke of York, 1664.

Delaware was embraced in the Maryland grant to Lord Baltimore, 1632; annexed to New York, 1664, and granted to Penn, 1682, and known as the Lower Counties. In 1703 it received a separate legislature.

GRANTS TO THE PLYMOUTH AND LONDON COMPANIES. 1606 and 1609.

The Grants of 1606 extended 100 miles inland, and the territory between the 38th and 41st parallels was included in both.

In 1609 and 1620 the 40th parallel was established as the dividing line, the Grants to extend from "sea to sea".

and the settlements in the North increased in number and population, the main Colony of Massachusetts Bay being established in 1628–30, and numerous towns in the neighboring district being soon founded, while settlements were made (1635–36) at Hartford, Wethersfield, and Windsor, the three towns which originally constituted the Colony of Connecticut, and for the administration of which was adopted in 1639 the first written constitution of representative government. In 1638 the Colony of New Haven was established. In this period also the same body of population extended northward into what became New Hampshire, as well as into the northeastern portion of Massachusetts. On the other hand, a representative of the aristocratic class founded the Colony of Maryland in 1634. During the period of the Commonwealth in England most of the immigrants were drawn from the Cavalier and Royalist classes, which were then out of power, and by this phase of migration Virginia and Maryland especially profited. Following the Restoration the increased power of the King in Colonial politics was illustrated in the grant of the Carolinas to a body of proprietors, and of Pennsylvania to a single proprietor, while in the same period New York, acquired in 1664 by conquest from the Dutch, was organized as a royal province. The administration of New Jersey was given over to a body of proprietors, and the various settlements in Rhode Island were organized by charter into a Colony. Throughout this period there was a steady development of uniformity in the provincial governments. At the basis of it all lay the principles of a democratic or representative government, which were brought to America by the earliest colonists. A representative and popular government was established in Virginia as early as 1619, before the founding of the New England Colonies, in which democratic institutions existed in form almost from the outset. Coincident with this growth of uniformity appeared indications of divergence in theory as to the proper position of the provinces within the province and where no provision was made for English state. On the one hand, in the instances where even the executive was chosen within the the approval of provincial laws by the King, there appeared substantially independent local autonomy, the prevalence of which type would create a thoroughly decentralized system of government. On the other hand, in the instances where the Governor and all important executive and judicial officers were appointees of the crown, where the Governor's Council was chosen by the crown, and where all provincial laws were subject to the approval of the crown, there was created a strongly centralized form of Imperial government. Both of these types of provincial administration appeared in the Colonial period, although they were irreconcilable, and as one form of government recognized privileges which the colonists would not relinquish and which the home Government would not recognize as rights, and as the other form included powers which the colonists claimed were improperly exercised by the King, it was inevitable that the attempt forcibly to harmonize the two systems should create such friction as to foreshadow revolution. Originally, the Colonies were regarded as within the King's exclusive jurisdiction, and it was not until the Protectorate and the reign of Charles II that they were considered as organic portions of the Empire, so as to be governed by Parliament. (See NAVIGATION LAWS.) Protests were made against this assumption; Massachusetts and other provinces asserted their rights of self-government and of exemption from parliamentary control; and it was not until the English revolution of 1688 that settled and uniform relations with the several Colonies were established, and the increased authority of Parliament, both within the realm and in the Colonies, was fully recognized.

The effect of that revolution made more critical the underlying problem of the Colonial situation, and gradually made conspicuous the issue whether in the Colonies the legislative authority of Parliament was paramount. On the other hand, the revolution had a beneficent effect upon the Colonies in terminating unrest and friction, which had characterized the administration of the later Stuarts. Even in Virginia the prevalent discontent had been given violent expression in Bacon's Rebellion (q.v.) in 1676, while in the Northern Colonies the many contests over jurisdiction and rights and the rule established by Andros (q.v.), who had been appointed Governor of the Dominion of New England—comprising all the Colonies between the St. Croix and the Delaware—developed a general disaffection among the people to the home government and culminated in the seizure of Andros, the overthrow of his administration (1689), and the uprising under Leisler in New York.

In 1713, by the Treaty of Utrecht, England, which had been importing slaves from Africa into its American and West Indian Colonies, obtained a monopoly of the slave trade to Spanish America for 33 years, and as a result of this arrangement slavery was extended in, and to some extent forced upon, all the American Colonies. See SLAVERY.

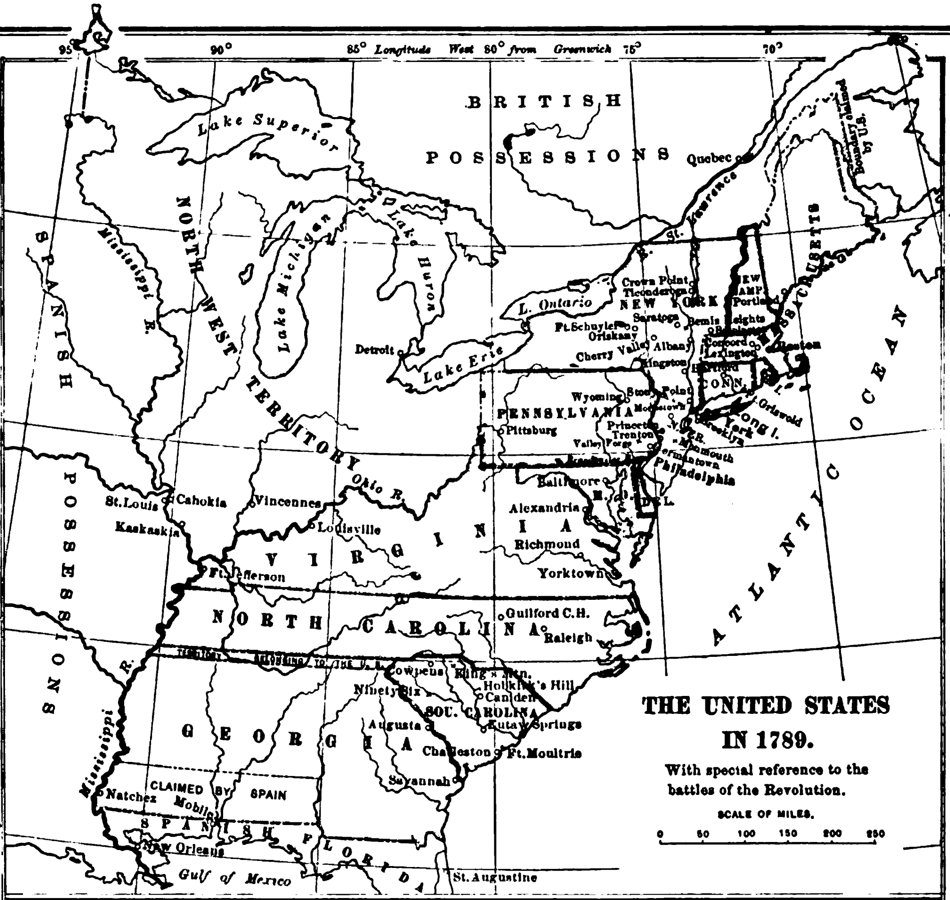
During much of the seventeenth and eighteenth centuries there was a general feeling of loyalty towards the mother country. The sons of the more wealthy colonists, especially in the South, were educated in England. English literature was widely read in the Colonies; the Colonies, though distinct and differing in origin and character—Puritan in the East, largely Dutch Reformed in New York, Quaker in Pennsylvania, to a considerable extent Roman Catholic in Maryland, Anglican in Virginia, and German and Irish in many of the back settlements—were yet for the most part united by language, blood, and institutions.

These influences towards harmony with the mother country served to obscure to a considerable degree the recurrent disputes over charter rights and trade privileges which continued to prevail in the eighteenth century; and the tendency to union among the several Colonies was strengthened by the outbreak of the French and Indian War (q.v.). This was the last in the series of conflicts (see KING WILLIAM'S WAR; QUEEN ANNE'S WAR; KING GEORGE'S WAR; also see CANADA) which resulted from the respective territorial ambitions in North America of France and Great Britain, and left the latter in undisputed possession of Canada as well as of the territory lying between the Alleghanies and the Mississippi. As a result of the termination of this long-continued struggle with the French, which was followed by the Pontiac conspiracy of 1763 (see PONTIAC), the Colonies, which had naturally borne the brunt of the various conflicts in America, were relieved of much of their dependence upon the home government and were left freer than they had earlier been to look after what they conceived to be their rights and interests. On the other hand, the financial necessities resulting from that war led to measures by the home government which aroused the colonists, strengthened their feelings of unity among themselves, and lessened their attachment to the English administration. Under such circumstances the basis of intercolonial unity gave force to the expressions and acts of the home government, as when in 1761 the enforcement of the Navigation Acts by general search warrants (see Assistance, Writs of) caused strong resentment against the home government, especially in New England, where the Admiralty attempted to enforce the law, many vessels being seized and the Colonial trade with the West Indies being seriously affected. In 1765 the passing of an Act of Parliament (see Stamp Act) for collecting a Colonial revenue by requiring the use of stamps not only upon many business papers and legal documents, but also upon certain articles of ordinary use, caused general indignation, and led even to riots. Steps were promptly taken to unite against the common danger of an extension of the authority of Parliament; the famous Stamp Act Congress, in which nine Colonies were represented, met at New York in September, 1765, and issued a statement of grievances and a declaration of rights. The stamps were destroyed or reshipped to England, and popular societies, called Sons of Liberty (q.v.), were formed in the chief towns. In 1766 the Stamp Act was repealed, to the general relief of the colonists; but the principle of Colonial taxation by Parliament was reaffirmed, and in 1767 duties were levied on glass, paper, printers' colors, and tea. Merchants in the Colonies attempted retaliation with nonimportation agreements, and in Boston the disturbances were such that Governor Gage was furnished with a military force to preserve order and enforce the laws. Thenceforth the relations between the provincial Legislature and the royal Governor were especially strained, and much bitter feeling among the people was caused by the so-called Boston Massacre (q.v.) of March 5, 1770. In 1773 the duties were repealed, excepting 3d. a pound on tea, when the matter resolved itself into a question of principle, and from North to South the people became determined that this tax should not be paid. In Boston a crowd, disguised as Indians, threw three cargoes of tea into the harbor (Dec. 16, 1773). As a penalty for such acts, Parliament passed in 1774 a series of punitive statutes, including the so-called Charter Act, by which the popular element in the provincial government of Massachusetts was greatly reduced and by which the former independence and authority of town meetings was strictly limited, and including also the Boston Port Bill (q.v.), by which the chief town of New England was to be no longer a port of entry.

The people of Massachusetts, relying upon the theory that their charter partook of the nature of a compact which could be altered or abrogated only by the consent of themselves and of the King, denied the right of Parliament to pass statutes in any way modifying their charter rights, and insisted that the course of the King and Parliament released the colonists from all obligations and reduced them so far as government was concerned, to a "state of nature." As early as the fall of 1774 the colonists began to organize local government on the assumption that administrative relations with England had been terminated and that the authority of the home government had ceased. Under such circumstances it was inevitable that the administration should undertake to apply a policy of repression. For further details of Colonial history, see, besides the articles already referred to, the articles on the various States.

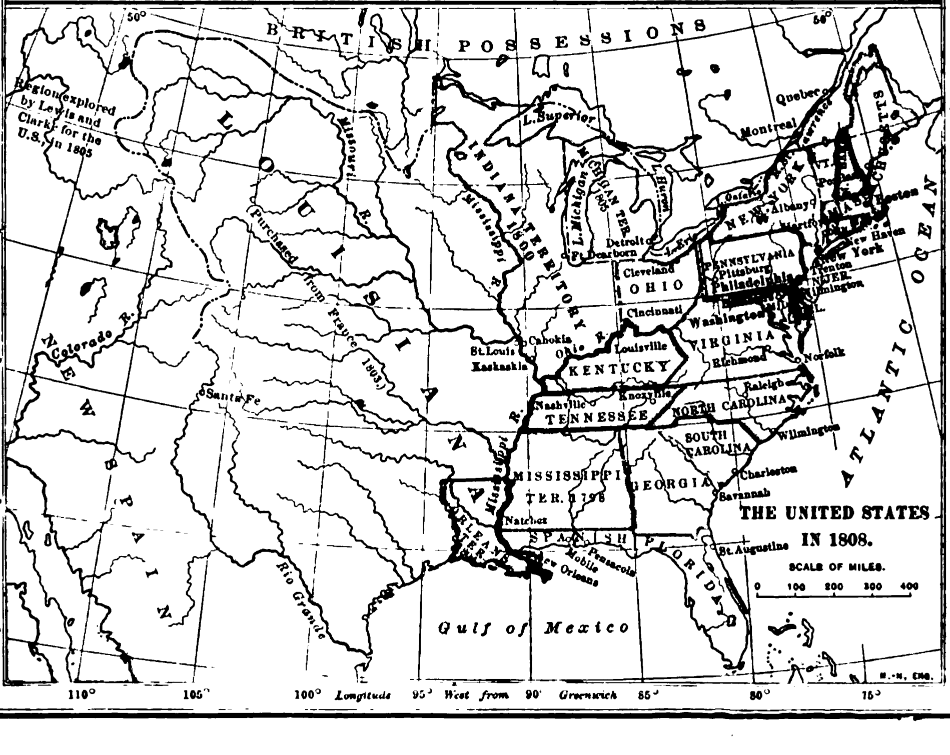
War of Independence. It was now determined to enforce the authority of Parliament over the Colonies, and a fleet, containing several ships of the line and 10,000 troops, was sent to America. The Colonies, still asserting their loyalty, prepared to resist what they considered the unconstitutional assumptions of the home government and the unwarranted violations of their rights as English citizens. Volunteers were drilling and depots of provisions and military stores were being formed. The sending of a small force from Boston to seize one of these depots at Concord, Mass., and to capture two of the most prominent provincial leaders, Samuel Adams and John Hancock, who were staying temporarily at Lexington, led to engagements at Lexington and at Concord (see Lexington) and the real beginning of the Revolutionary War, on April 19, 1775. The news of this event promptly brought from 15,000 to 20,000 armed provincials to the vicinity of Boston, to which place the British, then numbering less than 4000, were effectually confined. On May 25, 1775, reënforcements under Howe, Clinton, and Burgoyne increased the strength of the British army to 10,000 men. Outlying royal forts and arsenals, with their arms and munitions, were taken possession of by the colonists, and on May 10 and May 11 respectively Ticonderoga and Crown Point, the principal Northern fortifications, were surprised by organized forces and their artillery and stores appropriated. A congress of the Colonies, known as the Continental Congress, had assembled at Philadelphia in September, 1774, and after appeals to the home government, which proved unavailing, this body resolved to raise and equip an army of 20,000 men, and on June 15, 1775, appointed George Washington commander in chief. On June 17 Breed's Hill in Charlestown, near Boston, where a considerable force of Americans had hastily intrenched themselves, was taken by assault by the British troops, but with so heavy a loss that the defeat had for the provincials the moral effect of a victory. (See Bunker Hill, Battle of.) After a winter of great privation, during which they were closely besieged within the only city in their control, the British evacuated Boston March 17, 1776, carrying away in their fleet to Halifax a large number of Loyalists. To forestall an expected attack by Sir Guy Carleton, Governor of Canada, upon Ticonderoga, an American force under Montgomery was sent in August, 1775, to invade Canada by way of Lake Champlain, while in September another American force under Benedict Arnold was sent from Cambridge through the forests of Maine against Quebec. Montgomery captured Chambly, St. Johns, and Montreal, but on Dec. 31, 1775, the Americans were defeated before Quebec, Montgomery being killed and Arnold wounded. In the summer of 1776 Arnold, being forced to retreat, did so by way of Lake Champlain with masterly skill.

After the evacuation of Boston the British government put forth a stronger effort to reduce



THE UNITED STATES IN 1789.

With special reference to the battles of the Revolution.



THE UNITED STATES IN 1808.

the most intense indignation. (See X Y Z Correspondence.) War seemed imminent; indeed, hostilities actually began on sea, and General Washington was again summoned to command the army, with Hamilton as the actual head until the outbreak of hostilities. But a change in the French government made possible a reconciliation, and in 1800 a treaty removed the immediate cause of complaint.

Such popularity as the government had secured by its firm attitude towards France was soon lost by the passage, in 1798, of the Alien and Sedition Acts (q.v.). Resolutions of protest drawn by Jefferson and Madison were passed by the Legislatures of Virginia and Kentucky and became known as the Virginia and Kentucky Resolutions (q.v.). These resolutions expressed the extreme Anti-Federalist doctrine and precipitated an immediate agitation against the obnoxious laws, which helped to cause the defeat of the Federalist party in the presidential election of 1800. During Adams's administration the seat of the government was changed, in 1800, from Philadelphia, which had been the temporary capital for 10 years, to Washington, in the newly constituted District of Columbia, and John Marshall, who was destined to influence profoundly the constitutional law of the nation, became Chief Justice of the Supreme Court. In the election of 1800, 73 electoral votes were cast for Thomas Jefferson and the same number for Aaron Burr, also a Republican, while Adams had 65. There being thus no choice, the election was thrown, in accordance with Article II of the Constitution, into the House of Representatives, each State having only a single vote. After balloting for six days the House of Representatives elected Jefferson, who received the votes of 10 States, while four States voted for Burr and two voted in blank. Thomas Jefferson was thus chosen President and Aaron Burr Vice President.

IV and V. Thomas Jefferson's Administration.* (1801–09.) The election of Jefferson marked the complete triumph of the Republicans. He made a number of removals from office without cause, although chiefly of those whom Adams had appointed in the last hours of his administration and hence known as "midnight appointments." (See Marbury *v.* Madison.) Jefferson professed only to desire to maintain an equal distribution of offices between the parties and to consider only an applicant's capability and honesty. He felt free, however, to join in undoing the work of Adams by aiding in the repeal of the law creating new judicial offices to which Federalists had been appointed, and also by countenancing an attack which was made on the Federalist judges through impeachment. (See Chase, Samuel.) He began his term of office with the extreme theories of the strict constructionists as his guide, as was shown by the steps which were promptly taken to bring about the abrogation of the system of internal revenue (April, 1802), and to reduce to five years the term of residence requisite for naturalization (April, 1802), as also by the repeal, in December, 1803, of the National Bankruptcy Law of 1800. Nevertheless, the force of circumstances finally led Jefferson to adopt and carry through measures that involved as liberal an interpretation of the Constitution as any that the Federalists had ever advanced. The first of these measures was the purchase from France in 1803 of Louisiana, which had recently been acquired by France from Spain. (See San Ildefonso, Treaty of; Louisiana Purchase.) The annexation of this territory determined permanently the control of the Mississippi and accordingly was thoroughly approved in the trans-Alleghany regions; but there was immediately raised not only the question of the government's power so to acquire territory, but also the question whether the government had acted within its constitutional powers in concluding a treaty which guaranteed citizenship to former subjects of France, and there developed a vigorous though unavailing opposition to the purchase among the members of Congress from New England. The vast enlargement of the South helps to explain the opposition of the New England States. The application of a characteristic Republican policy was, however, illustrated in the marked tendency to minimize the importance of the functions of the national government and to render unimportant such departments as those of War and the Navy. The very material reduction of the national forces was accomplished without effective opposition in view of the improved financial condition which was supposed to be secured by such a course. Any such justification was soon overbalanced by the pressing need of an efficient navy occasioned by the war with Tripoli (1801–05), in which Preble and Decatur won laurels for the American flag. (See Barbary Powers, Wars with the.) In 1803 Ohio was admitted into the Union, and in December, 1803, Congress passed the Twelfth Amendment to the Constitution, which was ratified in 1804, providing that the electoral college should vote for presidential and vice presidential candidates separately. (See Constitution.) In 1804 Jefferson was reëlected President, receiving all the electoral votes except those of Connecticut and Delaware and two of Maryland, which were cast for the Federalist, Charles C. Pinckney, of South Carolina. George Clinton (q.v.), of New York, was elected Vice President.

Jefferson's second administration began with overwhelming Republican majorities in both Houses of Congress. The Napoleonic wars had begun anew in 1803, and it was impossible for such a struggle not to affect materially the interests of the United States. The commerce of America was highly prosperous, her ships enjoying much of the carrying trade of Europe; but in May, 1806, England declared a blockade from Brest to the Elbe, and Bonaparte, in November, decreed the blockade of the coasts of the United Kingdom. (See Continental System; Orders in Council.) The maritime rights of neutrals were not at that time clearly defined, and the Americans suffered at the hands of both belligerents, American vessels being seized and searched with great insolence and discourtesy for contraband of war and being searched also by the British for British subjects. The right of expatriation was not then recognized by England, and those suspected of having been born on British soil were, in accordance with the doctrine, "once a subject always a subject," impressed into the British naval service. The British frigate *Leopard*, meeting the American frigate *Chesapeake*, June 22, 1807, demanded four of her men, and on refusal fired into her, and the *Chesapeake* was forced to strike her flag. The incident created intense excitement and resentment, and British ships were thenceforth forbidden to enter American harbors. See Chesapeake, The.

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* Cabinet.—*Secretary of State*, James Madison, Virginia, March 5, 1801. *Secretary of the Treasury*, Samuel Dexter, continued; Albert Gallatin, Pennsylvania, May 14, 1801. *Secretary of War*, Henry Dearborn, Massachusetts, March 5, 1801. *Secretary of Navy*, Benjamin Stoddert, continued; Robert Smith, Maryland, July 15, 1801. (Jacob Crowninshield of Massachusetts was nominal Secretary of the Navy from March 3, 1805, till his death, April 15, 1808, Robert Smith continuing to discharge the duties of the office.) *Attorney-General*, Levi Lincoln, Massachusetts, March 5, 1801; Robert Smith, Maryland, March 3, 1805; John Breckinridge, Kentucky, Aug. 7, 1805; Cæsar A. Rodney, Pennsylvania, Jan. 20, 1807. *Postmaster-General*, Joseph Habersham, continued; Gideon Granger, Connecticut, Nov. 28, 1801.

In December, 1807, a further step was taken in the famous Embargo Act (see Embargo), which forbade American vessels to leave for foreign ports, and foreign vessels to take cargoes into American ports. This measure, which was intended to punish England and France for their contempt of American rights upon the seas, almost destroyed the commerce of the United States, and was violently opposed by the Federalists, especially in New England and New York, where the shipping interest was strongest. During Jefferson's administration Aaron Burr attempted to carry out a filibustering scheme against Louisiana or Mexico, and in addition he was charged with an attempt at the dismemberment of the Union, and in 1807 was tried for treason at Richmond, Va., but was acquitted. (See Burr, Aaron.) Jefferson's administration was also marked by the Lewis and Clark expedition (q.v.) across the continent to the Pacific (1804–06); by the passage of a bill in 1806 for the construction of a national road from Cumberland, Md., to Ohio, the first important internal improvement measure (see Cumberland Road); the establishment of the United States Military Academy at West Point, and the successful introduction of steam navigation by Fulton. (See Steam Navigation.) Another important event of Jefferson's administration was the passage of an Act of Congress in 1807 abolishing the slave trade from Jan. 1, 1808.

Following the example of Washington, Jefferson declined to be a candidate for a third term, and in the election of 1808 James Madison, of Virginia, was elected President, and George Clinton, of New York, Vice President. Charles C. Pinckney was again the Federalist candidate for President. In February, 1809, owing to the threatening attitude of the New England States, which seemed to menace the government with secession, the Embargo was relaxed and the Non-Intercourse Act was substituted for it, repealing the provisions of the Embargo, except as against England and France.

VI and VII. **James Madison's Administration.**[*] (1809–17.) The beginning of Madison's administration witnessed a further straining of relations between the United States and England. Though the acts of France had been, in the main, no less unjust and arrogant than those of England, she had never attempted the impressment of American seamen. Moreover, the Republican party, now in power, had been traditionally the friend of France. Hence, as time went on, England was especially singled out for American dislike, and this feeling increased when the West complained that British agents were exciting disaffection on the frontiers and intriguing with the Indians, color being given to this latter charge by the hostility of some of the Indians and Tecumseh's attempt to form an Indian confederation. See Tecumseh; Tippecanoe, Battle of.

War of 1812.—In 1810 England and France each professed a readiness to repeal the decrees that had so hampered American commerce, if the other would do so first. France then revoked conditionally the Berlin and Milan decrees, and in 1812 revoked them unconditionally, dating the revocation back one year. Meanwhile an aggressive element had risen to prominence in the councils of the Republican party. Henry Clay, of Kentucky, was Speaker of the House, and John C. Calhoun, of South Carolina, on the floor of the House was the leader of the majority. Under the impulse of these two brilliant and impetuous spirits, the party in power became transformed into a war party. Acts were passed to enlist soldiers, to organize the militia, to enlarge the navy, and to prepare in every way for war. The adoption of a war policy was urged upon the President, who was himself reluctant to adopt it. England having refused to modify her policy towards neutrals, an embargo upon all American shipping was proclaimed for 60 days as a preliminary to the opening of hostilities; and on June 1 Madison sent a message to Congress in which, after reviewing the American grievances against England, he recommended a formal declaration of war. The chief grounds for this action, as given by Madison, were the impressment of American seamen, the extension of the right of search to United States war vessels, the "paper blockades" established by the British Orders in Council, and the alleged efforts of Great Britain to persuade the Northwestern Indians to attack the Americans. On the 18th Congress formally declared war. Five days later, and before the declaration reached England, the British government withdrew its objectionable Orders in Council, but although attempts were then made to restore peace, reconciliation at that time was impossible. The disparity in power between the United States and Great Britain at this time was enormous, and except that the latter was still engaged in her conflict with Napoleon, a declaration of war would have seemed little less than foolhardy. In 1810 the population of the United States was only about 7,250,000, while that of Great Britain was fully 18,500,000. Great Britain, moreover, had vastly superior resources at her disposal, was organized for war, while the United States was not, and, besides having a large and highly disciplined army, was the acknowledged mistress of the seas. In general, the war went against the Americans on land, though the British were decisively repulsed at New Orleans; and the warfare on sea demonstrated the superiority, vessel for vessel, of the American to the British navy. Gradually, however, by reason of her vastly larger fleet, Great Britain defeated the American vessels in detail or drove them under the shelter of forts. The American naval successes were, nevertheless, of such number and of such tactical importance as to add greatly to the standing of the United States as a naval power. Congress

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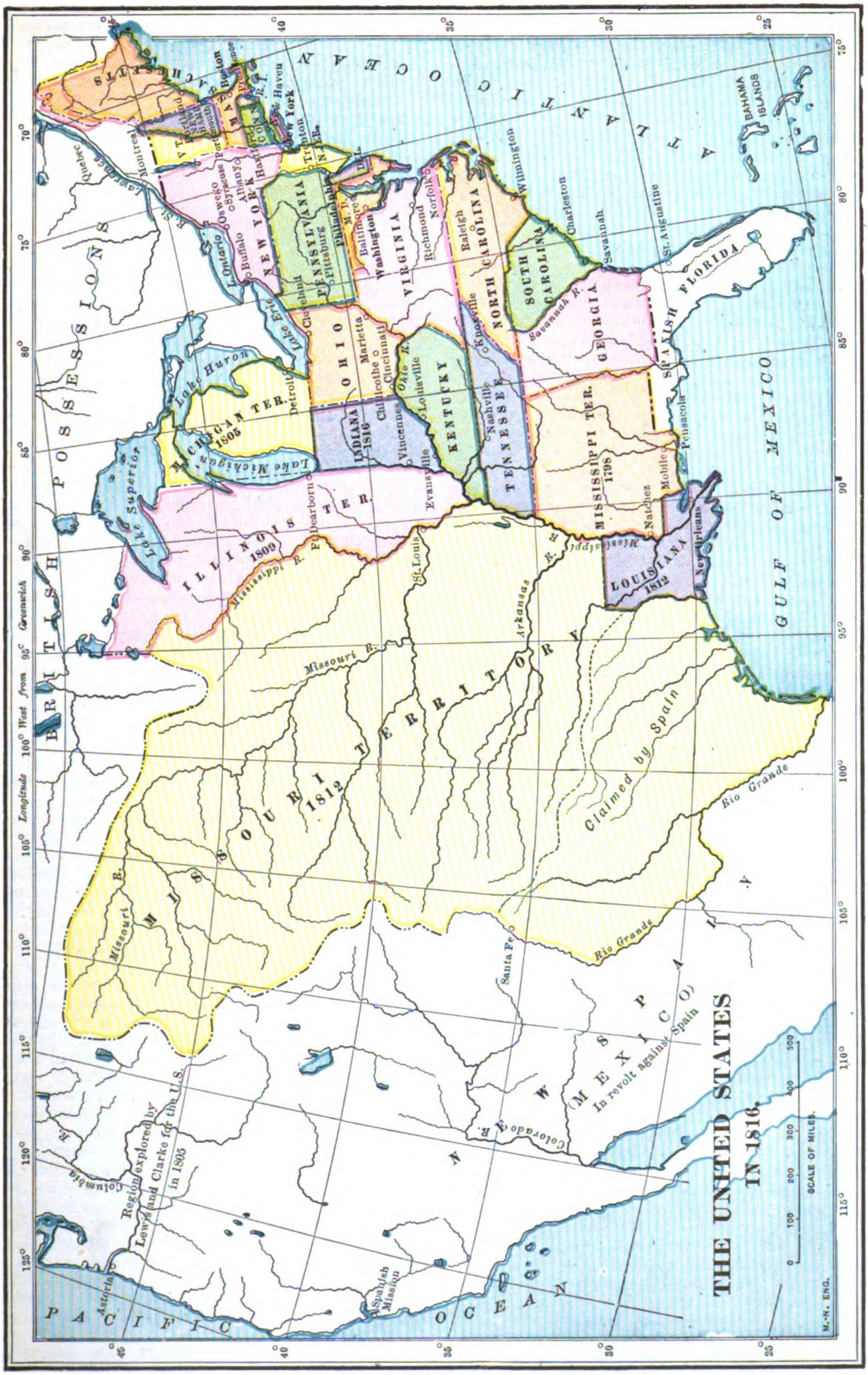
[*] Cabinet.—*Secretary of State*, Robert Smith, Maryland, March 6, 1809; James Monroe, Virginia, April 2, 1811. *Secretary of the Treasury*, Albert Gallatin, continued; George W. Campbell, Tennessee, Feb. 9, 1814; A. J. Dallas, Pennsylvania, Oct. 6, 1814; William H. Crawford, Georgia, Oct. 22, 1816. *Secretary of War*, William Eustis, Massachusetts, March 7, 1809; John Armstrong, New York, Jan. 13, 1813; James Monroe (acting), Sept. 27, 1814; William H. Crawford, Georgia, Aug. 1, 1815. *Secretary of the Navy*, Paul Hamilton, South Carolina, March 7, 1809; William Jones, Pennsylvania, Jan. 12, 1813; B. W. Crowninshield, Massachusetts, Dec. 19, 1814. *Attorney-General*, C. A. Rodney, continued; William Pinkney, Maryland, Dec. 11, 1811; Richard Rush, Pennsylvania, Feb. 10, 1814. *Postmaster-General*, Gideon Granger, continued; Return J. Meigs, Ohio, March 17, 1814.


THE UNITED STATES IN 1816.

had voted to raise 25,000 enlisted soldiers, 50,000 volunteers, and 100,000 militia. Gen. William Hull with over 2000 men at Detroit invaded Canada, but, on being met by a small force of British and Indians under General Brock, recrossed the river, and on August 16 surrendered at Detroit without resistance. A second invasion of Canada was made in October, 1812, near Niagara Falls, by General Van Rensselaer. One thousand American militia stormed the heights of Queenston, and the British general, Brock, was killed, but, reënforcements arriving, the heights were retaken, and the Americans were defeated with great loss, some of them surrendering. Some of the militia refused to cross into Canada, upon the ground that the government had no right to send the militia across the frontier.

American disasters on the land were, however, compensated for by victories at sea. On August 19 the United States frigate *Constitution* (q.v.) captured the British frigate *Guerrière;* on October 18 the *Wasp* (American) took the *Frolic* (British); on October 25 the *United States* captured the *Macedonian;* on December 29 the *Constitution* took the *Java;* and on February 24 the *Hornet* sank the *Peacock*. The Americans in most cases had the larger ships and heavier ordnance, but the immense disparity in the losses showed also superior seamanship and gunnery. American privateers, furthermore, took during the war, it is estimated, 300 British vessels and 3000 prisoners.

In May, 1812, Madison had been renominated for the presidency, with Elbridge Gerry, of Massachusetts, as the Republican candidate for Vice President. In the ensuing election Madison defeated De Witt Clinton by an electoral vote of 128 to 89, while Gerry defeated Jared Ingersoll by an electoral vote of 131 to 86.

In April, 1813, an American army of 1700 men under Gen. Henry Dearborn captured York, now Toronto, and, Dearborn having been relieved, Generals Wilkinson and Hampton undertook to capture Montreal, but met with no success. An attempt of the British general, Prevost, on Sackett's Harbor in May was repulsed; the British squadron on Lake Erie, consisting of 6 vessels carrying 63 guns, was captured on Sept. 10, 1813, by Commodore Perry at the head of an American flotilla of 9 vessels with 54 guns (see Erie, Battle of Lake); and this latter success enabled General Harrison to invade Canada, where he defeated General Proctor in the battle of the Thames (October 5), in which the great Indian warrior chief Tecumseh was killed. During the same period Gen. Andrew Jackson in Alabama and Georgia defeated the Creek Indians, who had been incited to make war upon the frontier settlements. In the summer of 1814 Gen. Jacob Brown, with Col. Winfield Scott as his second in command, crossed to the Canadian side, captured Fort Erie (q.v.) on July 2, and defeated General Riall at Chippewa on July 5. On July 25 the indecisive battle of Lundy's Lane was fought, the Americans being under the immediate command of Scott; and the American forces then withdrew to Fort Erie, where they were besieged. (See Fort Erie.) General Wilkinson also invaded Canada along the Sorel River, but was easily repulsed. A British invasion, by Lake Champlain, under Prevost, with 11,000 men and a flotilla on the lake, ended disastrously. On September 11 the flotilla was signally defeated in the harbor of Plattsburg by an American squadron under Commodore McDonough, while the army was repulsed on shore and retreated with heavy loss. In August a British fleet ascended Chesapeake Bay and landed troops which, after dispersing with little difficulty a force of American militia at Bladensburg (q.v.), entered Washington and burned the government buildings. A subsequent attack on Baltimore was unsuccessful. New York, New London, and Boston were blockaded, and a large expedition was sent against Mobile and New Orleans.

On Jan. 8, 1815, General Pakenham attacked New Orleans, but his army was repulsed with great loss by General Jackson at the head of an inferior militia force. (See New Orleans, Battle of.) This action was fought two weeks after peace had been concluded by the Commissioners of England and the United States.

From the middle of 1813 the fortunes of war alternated on the sea. On June 1, 1813, the American frigate *Chesapeake* was taken by the *Shannon* and the American sloop *Argus* by the *Pelican* on August 14; the British brig *Boxer* was captured by the *Enterprise* on Sept. 5, 1813; the American frigate *Essex*, after a memorable career under Porter, surrendered to the *Phœbe* and *Cherub* on March 28, 1814; the British brig *Epervier* was captured by the *Peacock* on April 29, 1814; the British sloop *Avon* was sunk by the *Wasp* on Sept. 8, 1814; on Jan. 15, 1815, after the conclusion of peace, the American frigate *President* was taken by the British; and on February 20 the American frigate *Constitution* captured the *Cyane* and the *Levant*.

In December, 1814, the Federalists of New England held a convention at Hartford in opposition to the war and the administration. (See Hartford Convention.) The treaty of peace concluded with England at Ghent on Dec. 24, 1814 (see Ghent, Treaty of), was announced in February, 1815. The terms did not include any affirmative withdrawal of England's claim to search American ships, but nevertheless all parties in the country approved it.

In 1815 Commodore Decatur commanded an expedition against the Algerians, whose corsairs had preyed on American commerce in the Mediterranean, and dictated terms to Algiers, Tunis, and Tripoli. See Barbary Powers, Wars with the.

With the end of the War of 1812 came the virtual extinction of the Federalist party, whose unpatriotic course during the struggle had made its name odious to the nation as a whole. It ceased thereafter to make itself felt in national affairs (see Federalists), and for a time the country had the singular fortune to find all its citizens seemingly of one party, with principles derived from both the old party creeds. Perhaps the most marked influence left by the Federalists upon the political tenets of their opponents and upon the popular mind was to be found in the now very general recognition of the broad powers of the central government. This national idea had sustained the Republicans in the more liberal view which the war had compelled them to take of the inherent powers of the Federal government. The noticeable effect of the war period in strengthening the Nationalist tendency was immediately illustrated by adequate plans for national defense; by the granting of the charter of the second United States Bank (see Bank, Banking) in 1816; by the passage of the first really protective tariff, under the guidance of Dallas, in the same year (see Tariff); and by the activity of Congress in attempting to appropriate large amounts of the national funds for public roads and similar improvements of a local character, an important bill for this purpose, passed by Congress in 1816, being, however, vetoed by Madison on the ground of its unconstitutionality. The tendency was also emphasized by judicial decisions (as in Martin *v.* Hunter's Lessee, 1816, and Cohens *v.* Virginia, 1821), establishing the supremacy of the Federal judicial power over that of the States, while in McCulloch *v.* Maryland, in 1819, Chief Justice Marshall introduced into the law of the land his advanced views as to the relation of the States to the Union and elaborated his theory of the supreme and exclusive authority of the latter. For the moment the close of Madison's administration found the country, as a whole, scarcely divided by party differences, so that the presidential election of November, 1816, resulted in the choice of James Monroe, of Virginia, as President, and Daniel D. Tompkins, of New York, as Vice President, these candidates receiving 183 electoral votes, while the votes of only three States—Massachusetts, Connecticut, and Delaware—were cast for the Federalist candidate, Rufus King, of New York. The Federalists made no formal nomination for the office of Vice President. In Madison's first administration Louisiana was admitted into the Union (1812), and in the second Indiana (1816).

VIII and IX. **James Monroe's Administration.*** (1817–25.) The period of Monroe's term of office has been commonly known in American political history as the Era of Good Feeling. Party questions were in abeyance, and when, in May, 1817, the President began an extended tour in the Northern and Western States, the warmth of the welcome given him by all classes of the people showed that the nation was contented, prosperous, and loyal. In accordance with the recommendations of the President's first message, the slightly protective tariff of 1816 was continued for seven years. (See Tariff.) On Dec. 10, 1817, Mississippi was admitted to the Union. In 1818 (December 3) Illinois became a State, and on Feb. 22, 1819, the United States purchased from Spain for $5,000,000 the territory of east and west Florida (in which region hostilities had recently been carried on against the Seminole Indians), together with all the claims which Spain might have to territory as far west as the Pacific, north of the forty-second parallel, including, of course, the Oregon country; while the United States relinquished all claim to the province west of the Sabine River (Texas). This treaty, however, was not formally ratified until 1821. Early in 1818 the people of the Territory of Missouri (q.v.), which had been included in the Louisiana Purchase, applied for admission to the Union. A bill providing for such admission was framed, but amended in the House in such a way as to forbid slavery in the new State. As so amended, the bill passed the House by the votes of the members from the free States, but was defeated in the Senate. This action brought the question of slavery prominently into the sphere of national politics, never again to disappear until the extinction of that institution as the result of the war between the States in 1861–65. In the Congress which met in December, 1819, the question of the admission of Missouri was again brought forward, coupled with a proposition for the admission of Maine, which had hitherto been a part of Massachusetts. An arrangement known as the Missouri Compromise (q.v.) was effected (1820) by the action of Clay and the conservative members of both sections. Maine was admitted in 1820 and Missouri in 1821, the latter step having been delayed by a vigorous debate in Congress occasioned by a clause in the proposed State constitution which prohibited the settling of free negroes in the State (see Missouri Compromise), the Missouri Legislature finally pledging the State not to shut out any negro citizen of another State. At the same session of Congress, Alabama was admitted to the Union (Dec. 14, 1819). In 1820 the presidential campaign resulted in the reelection of Monroe and Tompkins, Monroe receiving all the electoral votes but one, which was cast for John Quincy Adams.

In 1821 the strict constructionists among the Republicans defeated bills looking to a national canal system and a higher tariff, and the next year the President vetoed a bill for the outlay of national funds upon the Cumberland Road (q.v.). In December, 1823, in his annual message to Congress, Monroe promulgated the famous declaration that has since been known as the Monroe Doctrine (q.v.). In 1824, the Nationalist policy being then followed by a majority in both Houses, there was adopted a more strictly protective tariff, framed with the design of excluding foreign competitors from American markets (see Tariff), while a bill for making surveys for a national canal system also became law. The political issues arising out of the founding of a new government as well as out of international complications had now lost their importance, and attention was becoming centred on internal matters, as to none of which were sectional or fractional issues as yet clearly drawn, although the sudden introduction of the slavery question into congressional politics was to acquire more significance than any other circumstance of the administration. However, as there was now only one political party, the Republican, the presidential election of 1824 was largely a personal and factional contest. When the electoral votes were counted, 99 were for Andrew Jackson, of Tennessee, 84 for John Quincy Adams, of Massachusetts, 41 for William H. Crawford, of Georgia, and 37 for Henry Clay, of Kentucky; there being thus no choice for President, and the decision being thrown into the House of Representatives, where, by a coalition of the supporters of Clay and Adams, the latter was finally chosen, Adams receiving the votes of 13 States, while Jackson had those of seven, and Crawford those of four. The electors had chosen John C. Calhoun, of South Carolina, to be Vice President by a vote of 182 to 78 for various other candidates.

X. John Quincy Adams's Administration.*

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* Cabinet.—*Secretary of State*, John Quincy Adams, Massachusetts, March 5, 1817. *Secretary of the Treasury*, William H. Crawford, continued. *Secretary of War*, George Graham, Virginia, April 7, 1817; John C. Calhoun, South Carolina, Oct. 8, 1817. *Secretary of the Navy*, B. W. Crowninshield, continued; Smith Thompson, New York, Nov. 9, 1818; John Rogers, Massachusetts, Sept. 1, 1823; Samuel L. Southard, New Jersey, Sept. 16, 1823. *Attorney-General*, Richard Rush, continued; William Wirt, Virginia, Nov. 13, 1817. *Postmaster-General*, R. J. Meigs, continued; John McLean, Ohio, June 26, 1823.

* Cabinet.—*Secretary of State*, Henry Clay, Kentucky, March 7, 1825. *Secretary of the Treasury*, Richard Rush, Pennsylvania, March 7, 1825. *Secretary of War*, James Barbour, Virginia, March 7, 1825; Peter B. Porter, New York,

(1825–29.) A new division of the American people into parties dates from the beginning of this administration. The party previously known as Republican or Democratic-Republican soon took the name of Democratic (see Democratic Party), while the Clay and Adams factions, which had been identified with the doctrine of loose construction, after taking the name of National Republican, changed it eventually to that of Whig (see Whig Party), by which the party continued to be known for some 25 years. The basis for the new party division lay largely in the factional differences between the followers of Adams and those of Jackson, and one result of this was the prolonged controversy throughout the administration of Adams and the development of especially bitter relations between the factions of the leaders, which continued throughout the two terms of Jackson. Owing to the determined obstruction which was made by the opponents of the administration, few of its measures were carried, so that the net results of the four years' work were comparatively slight, and the period became distinguished chiefly by the partisan conflicts preliminary to the overthrow of the Adams faction in 1828.

During the suspension of commerce by the War of 1812 large amounts of capital were withdrawn from trading ventures and diverted to manufacturing establishments, with the result that gradually New England and the northern coast States ceased to be free-trade regions and became desirous of a protective tariff policy, while the South arrayed itself on the side of free trade. Upon the return of peace the new manufacturing establishments were not firmly enough established to compete successfully with the foreign manufacturers, and accordingly in 1824 an Act was passed for the purpose of giving the control of the home market to the wool manufacturers. This failing of its purpose, a national convention of Protectionists at Harrisburg, Pa., in July, 1827, advocated a strongly protective policy, and in 1828 a tariff framed in accordance with these views became law. The South denounced this measure as being sectional legislation, intended to benefit New England and the Middle States at the expense of the South, and the doctrine of nullification (q.v.), which had been promulgated in the Kentucky Resolutions of 1798 (see Virginia and Kentucky Resolutions), and had been revived in South Carolina in 1827, began to be widely accepted in the Southern States. Adams's administration was further marked by the expenditure by the national government of some $14,000,000 for internal improvements; by the rapid immigration to the West, greatly promoted by the opening of the Erie Canal; and by the debates in Congress over the advisability of sending delegates to the Panama Congress (q.v.). In 1828 the Democratic candidate for President, Andrew Jackson, of Tennessee, received 178 electoral votes to 83 cast for John Quincy Adams; and John C. Calhoun was reëlected Vice President, having 171 electoral votes. The accession of President Jackson was the beginning of a new era in political practice. A radical change was typified by the discontent with the existing methods, which led to the more direct participation of the public at large in political affairs through the rise of the nominating convention and through the practice of choosing presidential electors by popular vote. Nomination by State Legislatures had supplanted the former method of nominating by congressional caucus. This marked departure towards practical democracy was emphasized by the striking influence which the new Western States and their ideals and standards of life now secured over national politics.

XI and XII. **Andrew Jackson's Administration.*** (1829–37.) The bold, decisive, and impetuous character of President Jackson was shown in a general removal of those, down to small postmasters and tidewaiters, who had held office under the late administration and in the appointment of his own partisans. The administration was distinctively one of conflict, the chief issues being the United States Bank and the tariff; and Jackson was swayed throughout, to a considerable extent, by the influence of a group of friends who became known collectively as the kitchen cabinet (q.v.). South Carolina declared the high protective tariff acts of 1828 and 1832 to be unconstitutional and therefore null and void, and threatened to withdraw from the Union if an attempt were made to collect the duties on foreign importations. The President prepared to execute the laws by force; Calhoun resigned his office of Vice President, and in the Senate, to which he was promptly sent, asserted the doctrine of State rights, including the right of secession. (See Nullification.) A collision seemed imminent, but the affair was settled by a compromise bill, introduced by Henry Clay, providing for a gradual reduction of duties until 1842, when they were not to exceed 20 per cent ad valorem. As an incident of this controversy, though nominally occasioned by a resolution calling for an inquiry into the sale of government lands, occurred the famous debate (January, 1830) in the Senate between Daniel Webster (q.v.), of Massachusetts, and Robert Y. Hayne (q.v.), of South Carolina, in which the two opposing views regarding State rights, nullification, and the true interpretation of the Constitution were advocated and discussed with such eloquence, learning, and enthusiasm as to make the debate a landmark in the constitutional development of the United States. The same period witnessed the rise of the Antimasonic party, based on opposition to Freemasonry and to secret societies generally. See Morgan, William; Antimasons.

The President was a pronounced opponent of the national bank, the existence of which under its second charter was to continue to 1836. Jackson early raised the issue of its constitutionality, whereupon the friends of the bank introduced and carried through both Houses a bill

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May 26, 1828. *Secretary of the Navy*, S. L. Southard, continued. *Attorney-General*, William Wirt, continued. *Postmaster-General*, John McLean, continued.

* Cabinet.—*Secretary of State*, Martin Van Buren, New York, March 6, 1829; Edward Livingston, Louisiana, May 24, 1831; Louis McLane, Delaware, May 29, 1833; John Forsyth, Georgia, June 27, 1834. *Secretary of the Treasury*, Samuel D. Ingham, Pennsylvania, March 6, 1829; Louis McLane, Delaware, Aug. 8, 1831; William J. Duane, Pennsylvania, May 29, 1833; Roger B. Taney, Maryland, Sept. 23, 1833; Levi Woodbury, New Hampshire, June 27, 1834. *Secretary of War*, John H. Eaton, Tennessee, March 9, 1829; Lewis Cass, Michigan, Aug. 1, 1831; Benjamin F. Butler, New York, March 3, 1837. *Secretary of the Navy*, John Branch, North Carolina, March 9, 1829; Levi Woodbury, New Hampshire, May 23, 1831; Mahlon Dickerson, New Jersey, June 30, 1834. *Attorney-General*, John M. Berrien, Georgia, March 9, 1829; Roger B. Taney, Maryland, July 20, 1831; Benjamin F. Butler, New York, Nov. 15, 1833. *Postmaster-General* (the Postmaster-General first came to be a regular member of the cabinet in Jackson's administration), William T. Barry, Kentucky, March 9, 1829; Amos Kendall, Kentucky, May 1, 1835.

for its continuation. This was vetoed, and its supporters were unable to carry the bill over the veto. The question, however, was made the chief issue in the campaign of 1832, in which the decisive triumph of Jackson was taken by him to be a vindication of his policy and an assurance that he represented the popular will more accurately even than did Congress. The result was still further to strengthen his position and to increase his influence over congressional action. In the election of 1832 he received 219 electoral votes, as against only 49 for Henry Clay, 11 for John Floyd, of Virginia, and 7 for William Wirt, of Virginia. Martin Van Buren was elected Vice President, receiving 189 votes.

The Cherokee Indians in Georgia, who had attained to a certain degree of civilization, appealed to the President for protection against the seizure of their lands by the State; but they were told that he "had no power to oppose the exercise of the sovereignty of any State over all who may be within its limits"; and the Indians were obliged to remove to the territory set apart for them west of the Mississippi. In 1832, in the West, trouble with Indians had culminated in the Black Hawk War (see BLACK HAWK), and now in 1835 the Seminole War broke out in Florida, and a tribe of Indians, insignificant in numbers, under the crafty leadership of Osceola (q.v.), kept up hostilities for years, at a cost to the United States of several thousands of men and some $50,000,000. The removal in 1835 by order of the President of the government deposits from the United States Bank to certain State banks led to the weakening of the bank and, after some years, to the adoption of Van Buren's plan of an independent treasury. Later the Senate, which was controlled by the Whigs, as Jackson's opponents now styled themselves, led by Henry Clay, took the extraordinary step of passing formal resolutions of censure of the President for his order removing the government deposits from the bank. The President protested against the resolution, but the protest was not allowed by the Senate to appear upon the record. The warfare between the President and Senate continued through the next two years, the latter frequently rejecting the nominations made by the executive. In 1837, however, largely under the influence of Benton, the Senate, which had at last become Democratic, voted to expunge from its records the resolutions of censure already mentioned. In 1835 (December 7) the President announced to Congress that the national debt would soon be paid and that provision should be made for the surplus revenue which was anticipated. In June, 1836, a bill was passed providing that after Jan. 1, 1837, any surplus exceeding the sum of $5,000,000 should be divided among the States as a loan, subject to a recall by Congress; and in accordance with this Act some $28,000,000 was divided in 1837, which has never been recalled. In July, 1836, the President caused the famous Specie Circular to be issued, which ordered the agents of the government to receive only gold or silver in payment for public lands.

At this time Texas, which had been colonized by Americans, was endeavoring to free itself from Mexican control and to establish its independence. In February, 1837, the independence of Texas was recognized; its subsequent annexation was but an incident of westward expansion. Many manifestations of sympathy with the Texans were therefore made, and assistance was freely given them by individuals from every part of the Union, and a resolution recognizing the independence of Texas passed the Senate, but not the House. A new era in the slavery controversy had been inaugurated with the establishment of the *Liberator* by Garrison in 1831. The New England Antislavery Society was organized in 1832, and the American Antislavery Society at Philadelphia in 1833. (See SLAVERY; GARRISON, W. L.; PHILLIPS, WENDELL; ABOLITIONISTS; GAG RULES.) Arkansas (June 15, 1836) and Michigan (Jan. 26, 1837) were admitted to the Union. The administration of Jackson was further marked by the political acerbities growing partly out of the Peggy O'Neill affair (see EATON, MARGARET), and leading to the reorganization of the cabinet, by the treaty with France settling the spoliation claims and the treaty with England securing unrestricted direct trade with the British West Indies, by the adoption on a large scale by Jackson of the "spoils system," and by the introduction of railroads. The election of 1836 resulted in the success again of the Democratic party, whose candidate for President, Martin Van Buren, of New York, received 170 electoral votes, against 73 for William Harrison, of Ohio, and 51 scattering. No candidate for Vice President received a clear majority, and so the Senate elected Richard M. Johnson (q.v.), of Kentucky.

XIII. **Martin Van Buren's Administration.*** (1837–41.) Van Buren, in accordance with his pledges, carried out and perpetuated the policy of his predecessor. The new administration was unfortunate in its beginnings. A financial disaster, such as had not until then been known in the United States, swept over the country in 1837. A general suspension of specie payments occurred; many banks suspended altogether, and innumerable corporations and individuals were ruined. Congress authorized the issue of $10,000,000 in treasury notes, and Jackson's Specie Circular was revoked. Van Buren's administration was marked by the establishment of the independent treasury system (reëstablished in 1846), by a renewal of hostilities against the Seminole Indians, and by the establishment of regular steamship communication with Europe. The Democrats with difficulty retained control of the House of Representatives, and through such methods as to decrease public confidence in the party leaders. This, together with the prevalent depression in business, weakened the dominant party in the country at large, so that in the campaign of 1840 the candidacy of the Whig nominee, Gen. William Henry Harrison (q.v.), of Ohio, was supported with an enthusiasm such as no subsequent political campaign has ever witnessed. It has become known as the Log Cabin Campaign and the Hard Cider Campaign, from the prevalent symbols of the homely and simple frontier life of General Harrison. The Liberty party (q.v.) also made nominations, their candidates being James G. Birney (q.v.), of New York, for President, and Francis Lemoyne, of Pennsylvania, for Vice President. The Democrats renominated Van Buren, but the convention did not agree upon the choice of a candidate

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*CABINET.—*Secretary of State*, John Forsyth, continued. *Secretary of the Treasury*, Levi Woodbury, continued. *Secretary of War*, Joel R. Poinsett, South Carolina, March 7, 1837. *Secretary of the Navy*, Mahlon Dickerson, continued; James K. Paulding, New York, June 25, 1838. *Attorney-General*, Benjamin F. Butler, continued; Felix Grundy, Tennessee, July 5, 1838; Henry D. Gilpin, Pennsylvania, Jan. 11, 1840. *Postmaster-General*, Amos Kendall, continued; John M. Niles, Connecticut, May 19, 1840.

for the vice presidency. General Harrison received 234 electoral votes to 60 for Van Buren; and for Vice President the Whig, John Tyler, of Virginia, received 234, against 48 for R. M. Johnson and 12 scattering.

XIV. **William Henry Harrison's** (1841) **and John Tyler's Administration.**[*] (1841–45.) Two weeks after his inauguration, President Harrison issued a proclamation calling an extra session of Congress to consider the financial distress prevailing throughout the country and other questions that beset the government. The extra session was called for May 31, but on April 4 the President died after a short illness. The new President, John Tyler, retained for a few months his predecessor's cabinet. When Congress met in accordance with General Harrison' call of March 17, the Whigs, who had a majority in both Houses, began to carry out the changes to which their party had pledged itself in the campaign of the preceding year. A bill was passed for the incorporation of a new United States Bank, to be called the Fiscal Bank of the United States, planned somewhat after the model of that which had been so vigorously attacked by President Jackson. To the consternation of the Whigs, the new President on August 16 vetoed it as being unconstitutional, since it provided for the establishment of branches of the bank in the various States without securing the prior consent of these States. The leading members of the party then conferred with President Tyler and asked him to suggest the provisions of a bill that he would be willing to accept. He is said to have agreed to do so, yet after the bill had passed the two Houses (September 3) it promptly met the fate of the former Act. It now became evident that the President was at heart a Democrat, and that his political principles would prevent him from acting cordially with the party that had elected him to office. The indignation and chagrin of the Whigs were unbounded. The entire cabinet with one exception immediately resigned, Webster remaining in the State Department until pending negotiations with England had been completed. On September 11 the leaders of the Whig party issued a manifesto reading the President out of the party and holding him responsible for the failure to effect the reforms that had been promised. President Tyler immediately filled the places in his cabinet with conservative politicians and, having been cut off from political affiliation with his own party, turned to the Democrats for support.

During Tyler's administration the relations between the United States and Great Britain became very strained. In the course of an insurrection in Canada in 1837 a party of supporters of the Canadian government had crossed over to the American territory and destroyed a vessel, the *Caroline*, owned by the friends of the insurgents. In the affair one American had been killed. In 1840 one Alexander McLeod, who had come to New York State and boasted of having taken part in the destruction of the *Caroline*, was arrested and indicted for murder. England protested vigorously, and serious international complications for a time seemed imminent. (See Caroline.) Again, in October, 1841, the British freed most of the slaves aboard an American vessel, the *Creole*, which had been seized by them and carried into a port in the Bahamas. (See Creole Case.) Thus each nation had a grievance against the other, and such ill feeling resulted that war was feared.

Fortunately Webster, Tyler's Secretary of State, was liked and respected by English statesmen, and upon the reorganization of the cabinet he retained his office until the pending negotiations were concluded. In 1842 Lord Ashburton was sent out from England to negotiate a treaty, with particular reference to adjusting the boundary between Canada and the Northeastern States. The boundary question was settled by a compromise, England gaining by the treaty 5000 more square miles than the Treaty of 1783 allowed her. Two other points of importance were settled by this treaty. One was the agreement of the two governments looking to the suppression of the slave trade. The other was the provision for mutual surrender of criminals. The treaty was concluded on Aug. 9, 1842, and was proclaimed on November 10. See Northeast Boundary Dispute; Webster-Ashburton Treaty.

In 1844 the government arranged a treaty with the new Republic of Texas (q.v.), providing for the future annexation of that country to the United States. The Senate rejected this treaty by a vote of 35 to 16, seven Democrats voting with the Whigs for rejection. The problem of the future relations with Texas became still more critical in national politics, and its immediate importance was increased by the strong desire for annexation among the Southern leaders. To maintain the status quo the annexation of Texas became an actual necessity to the interests of the South; for should the free States ultimately acquire a dominant power in the Senate, as they had already done in the House, the time might come when the existence of slavery would be imperiled. The possibility of this was kept continually before the Southern mind by the increasing activity in the North of the Liberty party (q.v.), which in 1843 held a national convention at Buffalo and there put forth a series of resolutions denouncing slavery, and calling on the free States to pass penal laws to prevent the return of fugitive slaves, and which again nominated James G. Birney for the presidency. England was taking an active interest in Texas affairs, which alarmed many people, North and South, lest this splendid region should be lost. The Whigs at their convention held at Baltimore in May, 1844, nominated Henry Clay, of Kentucky, with Theodore Frelinghuysen, of New York, as the candidate for Vice President. The Democratic convention, in the same month, nominated James K. Polk, of Tennessee, and George M. Dallas, of Pennsylvania, and adopted a platform calling for the reannexation of Texas and the reoccupation of Oregon. The position of Clay as to the annexation of Texas was so equivocal as to arouse the suspicion of many

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[*] CABINET.—*Secretary of State*, Daniel Webster, Massachusetts, March 5, 1841; Hugh S. Legaré, South Carolina, May 9, 1843; A. P. Upshur, Virginia, July 24, 1843; John C. Calhoun, South Carolina, March 6, 1844. *Secretary of the Treasury*, Thomas Ewing, Ohio, March 5, 1841; Walter Forward, Pennsylvania, Sept. 13, 1841; John C. Spencer, New York, March 3, 1843; George M. Bibb, Kentucky, June 15, 1844. *Secretary of War*, John Bell, Tennessee, March 5, 1841; John McLean, Ohio, Sept. 13, 1841; John C. Spencer, New York, Oct. 12, 1841; James M. Porter, Pennsylvania, March 8, 1843; William Wilkins, Pennsylvania, Feb. 15, 1844. *Secretary of the Navy*, G. E. Badger, North Carolina, March 5, 1841; A. P. Upshur, Virginia, Sept. 13, 1841; David Henshaw, Massachusetts, July 24, 1843; T. W. Gilmer, Virginia, Feb. 15, 1844; John Y. Mason, Virginia, March 14, 1844. *Attorney-General*, John J. Crittenden, Kentucky, March 5, 1841; Hugh S. Legaré, South Carolina, Sept. 13, 1841; John Nelson, Maryland, July 1, 1843. *Postmaster-General*, Francis Granger, New York, March 6, 1841; Charles A. Wickliffe, Kentucky, Sept. 13, 1841.

Northerners, while the position of the Democrats on the Oregon question helped them in the Northwestern States. The election resulted in the choice of Polk and Dallas after a very close contest in which the Democrats succeeded only by the fact that several thousand votes in New York were cast for the antislavery ticket.

At the next session of Congress a joint resolution for the annexation of Texas was passed early in 1845 by both Houses and approved on March 1 by the President. It renewed the features of the Missouri Compromise as regards the Texan territory north of the compromise line, and as to the territory south of that line the question of slavery was left to the decision of the inhabitants of the States to be formed out of Texas.

Tyler's administration was marked by the Dorr Rebellion in Rhode Island (see DORR, THOMAS W.; RHODE ISLAND), by antirent disturbances in New York (see ANTIRENTISM), and by the construction under the direction of S. F. B. Morse (q.v.) of the first successful long-distance telegraph line (1844).

XV. **James K. Polk's Administration.**[*] (1845–49.) *War with Mexico.*—Soon after the beginning of Polk's administration United States troops under General Taylor were sent across the Nueces River to Corpus Christi, in territory then in dispute between the United States and Mexico, the United States claiming the Rio Grande as the boundary of Texas, and Mexico claiming the Nueces. In the meantime both the Texan Congress (on June 18, 1845) and a convention of the people (on July 4) had ratified the act of annexation, and on December 29 Texas formally entered the Union. Up to this date Mexico, being distracted by revolutions, had simply protested against the action of the United States and had recalled her Minister from Washington; but in the spring of 1846 the further advance of General Taylor towards the Rio Grande brought United States troops into conflict with the Mexicans, a small engagement taking place on April 24. The Mexicans were then defeated at Palo Alto on May 8 and on the following day at Resaca de la Palma. On May 11, 1846, news of the hostilities on April 24 having reached Washington, the President officially informed Congress of the occurrence and asked that war be declared. Both Houses responded to the message and to the awakened war spirit of the country by passing a bill (on May 13) whose preamble began as follows: "Whereas, by the act of Mexico, a state of war exists between that government and the United States"—a statement that provoked much criticism from the opponents of the administration, as false, in view of the fact that hostilities had been precipitated by the military occupation of territory claimed by Mexico. The bill appropriated $10,000,000 for the prosecution of the war, and under it enlistment was actively begun. Volunteers to the number of 50,000 men were authorized. On May 23 Mexico formally declared war upon the United States. Whatever view one might take of the political aspect of the war, the brilliant series of victories aroused widespread enthusiasm and pride; as against forces that outnumbered them, sometimes four to one and not inferior in training, in a hostile country and against formidable obstacles, both natural and artificial, the troops of Taylor and Scott won successive triumphs by the most splendid courage and the most stubborn fighting. For a detailed account, see MEXICAN WAR.

On Feb. 2, 1848, peace was signed at Guadalupe Hidalgo (q.v.). Mexico resigned her claim to Texas, agreeing to the Rio Grande as the boundary, and also ceded New Mexico and Upper California to the United States for a payment of $15,000,000, the completion being thus attained of that great westward movement which had been going on since the Revolution.

Other important events of Polk's administration were the treaty with England (June 15, 1846) by which the long-disputed question of the northwest boundary was settled (see NORTHWEST BOUNDARY DISPUTE; OREGON); the so-called tariff of 1846 (see TARIFF), which limited its purpose to the collection of revenues alone without protection to native industries; the reënactment (1846) of the Independent Treasury Act; the introduction of the Wilmot Proviso (q.v.); the formation of the Free-Soil party; the admission of Iowa (Dec. 28, 1846); the establishment of the new Territory of Oregon without slavery, and the admission of Wisconsin (May 29, 1848). It was during Polk's term also that in 1848 gold was discovered in California, that the sewing machine was patented (1846) by Elias Howe, and that the use of anæsthetics was introduced in surgery. It was at this time that the great flood of Irish immigration consequent upon the potato famine of 1846 began.

The opposing candidates at the presidential election of 1848 were Lewis Cass (q.v.), of Michigan, and William O. Butler, of Kentucky, Democrats, against Gen. Zachary Taylor, of Louisiana, and Millard Fillmore, of New York, Whigs, the newly organized Free-Soil party (q.v.) nominating Martin Van Buren, of New York, and Charles Francis Adams, of Massachusetts. Taylor and Fillmore received 163 electoral votes as against 127 cast for Cass and Butler, the Democratic vote being reduced by the support given by the Barnburners (q.v.) in New York to Van Buren.

XVI. **Zachary Taylor's** (1849–50) **and Millard Fillmore's Administration.**[*] (1850–53.) The course of American political history from the beginning of this administration down to the Civil War is marked by a gradual disintegration of the old Whig party (q.v.), the increase in importance of the free-soil movement, culminating in the formation of the Republican party, and the development of the Democratic party into an organization whose foremost object, in so far as it was under the control of the Southern wing, was the maintenance of slavery and the perpetuation of the political power in

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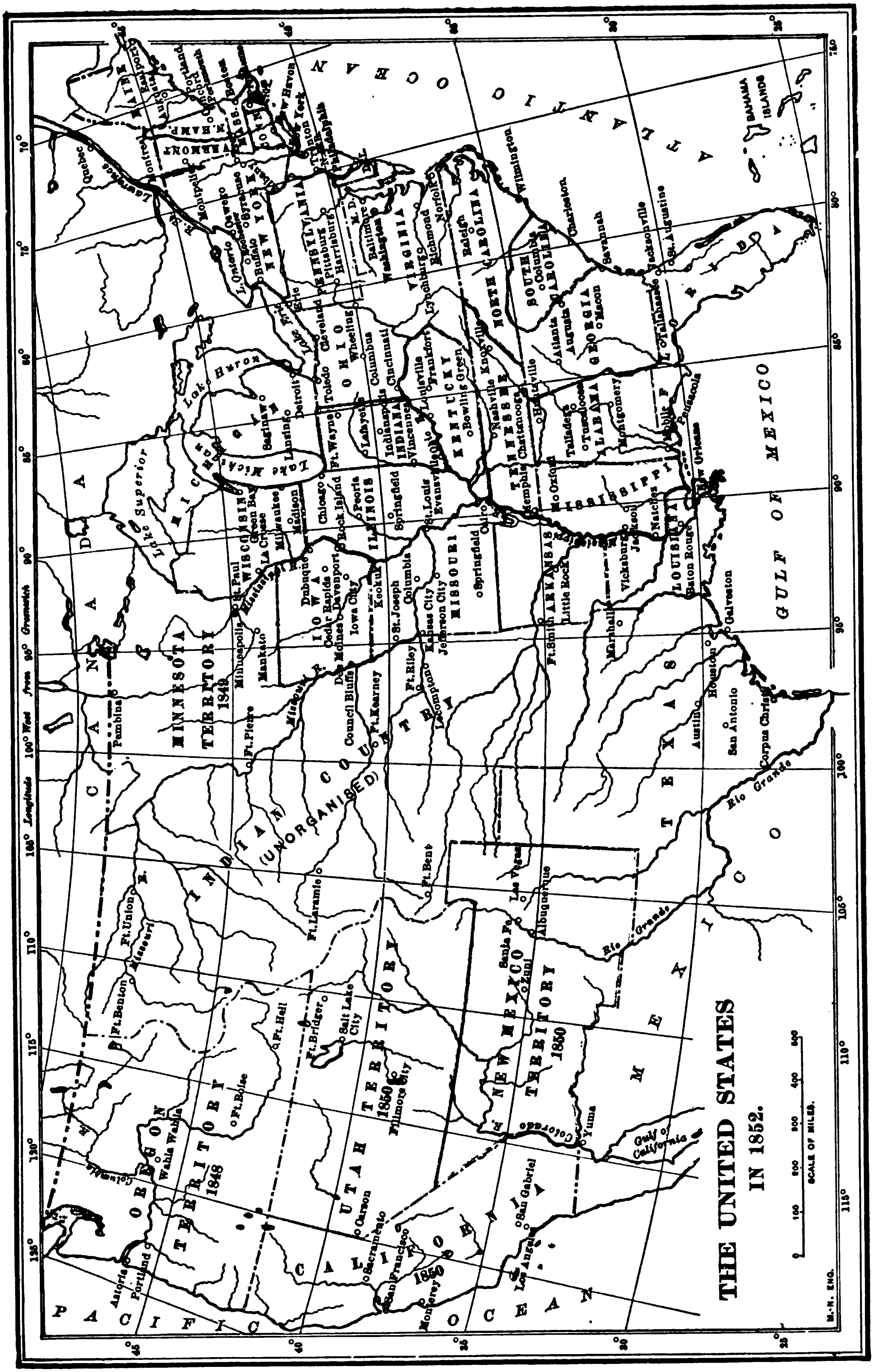
[*] CABINET.—*Secretary of State*, James Buchanan, Pennsylvania, March 6, 1845. *Secretary of the Treasury*, Robert J. Walker, Mississippi, March 6, 1845. *Secretary of War*, William L. Marcy, New York, March 6, 1845. *Secretary of the Navy*, George Bancroft, Massachusetts, March 10, 1845; John Y. Mason, Virginia, Sept. 9, 1846. *Attorney-General*, John Y. Mason, Virginia, March 5, 1845; Nathan Clifford, Maine, Oct. 17, 1846. *Postmaster-General*, Cave Johnson, Tennessee, March 6, 1845.

[*] CABINET.—*Secretary of State*, John M. Clayton, Delaware, March 7, 1849; Daniel Webster, Massachusetts, Dec. 6, 1850. *Secretary of the Treasury*, W. M. Meredith, Pennsylvania, March 8, 1849; Thomas Corwin, Ohio, July 23, 1850. *Secretary of War*, George W. Crawford, Georgia, March 8, 1849; Winfield Scott (ad interim), July 23, 1850; Charles M. Conrad, Louisiana, Aug. 15, 1850. *Secretary of the Navy*, William B. Preston, Virginia, March 8, 1849; William A. Graham, North Carolina, July 22, 1850; J. P. Kennedy, Maryland, July 22, 1852. *Secretary of the Interior*, Thomas H. Ewing, Ohio, March 8, 1849; A. H. H. Stuart, Virginia, Sept. 12, 1850. *Attorney-General*, Reverdy Johnson, Maryland, March 8, 1849; John J. Crittenden, Kentucky, July 22, 1850. *Postmaster-General*, Jacob Collamer, Vermont, March 8, 1849; Nathan K. Hall, New York, July 23, 1850; S. D. Hubbard, Connecticut, Aug. 31, 1852.


THE UNITED STATES IN 1852.

the slave States. The increase of territory out of which new States might be created made the South anxious to prevent these new States from inhibiting slavery, as would probably be done in some of them, especially in California, if the question were left to the inhabitants. The contest began actively in 1846, while the acquisition of the land in question was still doubtful. In that year David Wilmot, a Representative from Pennsylvania, brought forward a resolution providing that slavery should be excluded from all territories that might be acquired from Mexico. This, commonly called the Wilmot Proviso, was carried in the House of Representatives, but was defeated in the Senate. (See Wilmot Proviso.) So fierce did the strife become that many of the most thoughtful statesmen began to fear secession or civil war. In this crisis Clay, now a man of 72 and in broken health, came forward in 1850 as a peacemaker. Like Webster, who now vigorously supported him, Clay had always held a moderate position between the two extreme parties in the slavery controversy. His proposal was that no legislation concerning slavery in California, about to be admitted as a State, and in the new Territories should be enacted by Congress. He also proposed that the slave trade should be abolished in the District of Columbia, but that a stricter law for the rendition of fugitive slaves should be enacted. In September, 1850, Clay's scheme, with important changes, was put into effect by Congress by the enactment of the so-called Compromise Measures of 1850. The passage, however, of the new Fugitive Slave Law excited at the North feelings of repugnance and disgust; and several of the State Legislatures even passed laws, commonly known as Personal Liberty Laws, intended especially for the protection of negroes. See Compromise Measures of 1850; Fugitive Slave Law; Underground Railroad.

President Taylor died on July 9, 1850. His successor, Millard Fillmore, strictly carried out the policy of his party. The Compromise Measures were approved by the new President, and their final adoption caused a temporary lull in the contest over the question of slavery.

During the administration of President Taylor was concluded (April 19, 1850) the Clayton-Bulwer Treaty (q.v.), respecting an interoceanic canal. The secession sentiment in the South found expression in the Nashville Convention of June 9.

In June, 1852, the two great parties made their presidential nominations. The candidates of the Democracy were Franklin Pierce, of New Hampshire, and William R. King, of Alabama; the Whigs nominated Gen. Winfield Scott, of Virginia, and William A. Graham, of North Carolina. Each of the leading parties adopted a platform which recognized the "finality" of the Compromise of 1850. In August the Free-Soil party nominated John P. Hale, of New Hampshire, and George W. Julian, of Indiana. The election resulted in the success of the Democratic ticket, which received 254 electoral votes against 42 cast for the Whig nominees. The years of this administration were marked by the deaths of three of the most influential political leaders, Calhoun (March 31, 1850), Clay (June 29, 1850), and Webster (Oct. 23, 1852).

XVII. Franklin Pierce's Administration.[*]

(1853–57.) In spite of the finality planks in the presidential campaign, the question of slavery soon came once more to the front. The leader in reviving the struggle was Stephen A. Douglas (q.v.), by whom, in January, 1854, the Kansas-Nebraska Bill (q.v.) was introduced into Congress. The Senate promptly passed this bill, and two months later it was passed by the House. (See Popular Sovereignty.) This led to the final disruption of the old Whig party. A new party, based on opposition to slavery, now arose in the North, whose members at first generally styled themselves Anti-Nebraska Men and which soon developed into the Republican party (q.v.). It was composed of men opposed to the extension of slavery without regard to former party affiliations—Whigs, Democrats, Know-Nothings, and Free-Soilers. The bulk of the Southern Whigs for the time being became Know-Nothings. The so-called American party, or Know-Nothings, who about this time began to exercise great influence, demanded especially more stringent naturalization laws and the election to high office of none but native-born citizens.

This virtual repeal of the Missouri Compromise, which left the new Territories to decide for themselves whether they would admit slavery or not, turned Kansas, as the Territory nearest the settled States, into a battleground for the two parties. The partisans of the North and those of the South kept pouring in fresh immigrants to outnumber the other side. At first the South was successful, and a code of laws was established with many and stringent provisions in behalf of slavery, although this was brought about, not by legitimate immigrants, but chiefly by a mob of Missourians, who passed across the border, took possession of the polling places, and carried the elections. A succession of outrages, amounting to civil war, followed, each faction establishing its own government and electing its delegate to Congress. President Pierce issued a proclamation (Feb. 11, 1856) calling for obedience to the laws and a cessation of violence and interference. Civil war, however, actually existed in Kansas. The two anti-slavery towns, Lawrence and Ossawatomie, were sacked, and the Free-Soil Legislature was twice dispersed. The outrages continued and no solution of the problem was reached during this administration. (See Kansas.) In the meantime public sentiment was excited to a still greater intensity by the assault upon Senator Charles Sumner (q.v.), of Massachusetts, by Preston S. Brooks (q.v.), of South Carolina (May 22, 1856).

In diplomacy during this administration friction arose between the United States and Austria over the Koszta affair (q.v.), and an important treaty was negotiated by Commodore Perry with Japan, by which intercourse was first opened between that country and the Western world.

In the presidential election of 1856 the following tickets were in the field: Democratic, James Buchanan, of Pennsylvania, and John C. Breckinridge, of Kentucky; Republican, John C. Frémont, of California, and William A. Dayton, of New Jersey; Know-Nothing, Millard Fillmore, of New York, and A. J. Donelson, of Tennessee. The Democratic ticket received 174 electoral votes, the Republican 114, the Know-Nothing 8.

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[*] Cabinet.—*Secretary of State*, William L. Marcy, New York, March 7, 1853. *Secretary of the Treasury*, James Guthrie, Kentucky, March 7, 1853. *Secretary of War*, Jefferson Davis, Mississippi, March 7, 1853. *Secretary of the Navy*, James C. Dobbin, North Carolina, March 7, 1853. *Secretary of the Interior*, Robert McClelland, Michigan, March 7, 1853. *Attorney-General*, Caleb Cushing, Massachusetts, March 7, 1853. *Postmaster-General*, James Campbell, Pennsylvania, March 7, 1853.

XVIII. **James Buchanan's Administration.*** (1857–61.) Two days after Buchanan's inauguration the Supreme Court rendered its decision in the famous Dred Scott Case (q.v.), in which the majority of the justices held that Congress had no right to prohibit slavery in any Territory and that slaves themselves were mere property whose secure possession in any Territory of the Union was guaranteed by the Constitution.

Events now succeeded one another with exciting rapidity. The sympathizers with the South had made various attempts to extend the area of slavery by the acquisition of Cuba. In 1854 the American ministers to England, France, and Spain met at the Belgian town of Ostend and there issued the so-called Ostend Manifesto (q.v.) to the effect that under certain contingencies the safety of the United States would demand the annexation of Cuba. Another attempt to acquire slave territory was through filibustering expeditions, the most famous of which were that of López to Cuba in 1851 and that of William Walker (q.v.) from 1855 to 1858 to Central America. Even the reopening of the African slave trade began to be discussed.

In September, 1857, the proslavery party in Kansas held a convention at Lecompton and proceeded to impose slavery upon the future State by submitting to the voters the alternative of voting for a clause in the Constitution *with* slavery or the Constitution *without* slavery, the instrument itself, however, affirming the right to the ownership of slaves at the time within the Territory. The antislavery party, whose Topeka Constitution had previously been disallowed by the Federal government, generally abstained from voting, with the result that the Constitution *with* slavery was adopted. (See Lecompton Constitution.) A new Territorial Legislature with an antislavery majority ordered a new election, at which the Constitution was to be accepted or rejected. It was rejected (January, 1858). The National Congress passed a bill resubmitting the Lecompton Constitution to the vote of the people, its adoption to be followed by the immediate admission of Kansas as a State. They rejected it, and thus Kansas remained a Territory. In 1859 a new convention adopted another Constitution, known as the Wyandotte Constitution, prohibiting slavery, and this, being submitted to the people, was adopted by them. Kansas, however, was not admitted as a State until 1861. The controversy in Congress over the admission of Kansas under the Lecompton Constitution proved an event of momentous importance as leading up to the division of the Democratic party in the presidential campaign of 1860. Minnesota was admitted in May, 1858, and Oregon in February, 1859. In 1858 occurred the famous Lincoln-Douglas debates (see Lincoln, Abraham), and a marked impression was caused by the publication of Helper's *Impending Crisis*. (See Helper, Hinton Rowan.) In the following year occurred John Brown's raid on Harper's Ferry (q.v.). (See Brown, John.) The South approached the campaign of 1860 with the conviction that there was no place for the South in an antislavery Union, and that the success of the Republicans, even though the Republican party did not mean to interfere with slavery in the States, would mean an antislavery Union.

In the presidential election of 1860 the situation was more complicated than ever before, and finally there appeared four tickets in the field. The Northern Democrats (see Democratic Party) nominated Stephen A. Douglas, of Illinois, and Herschel V. Johnson, of Georgia; the Southern Democrats, who had seceded from the Democratic convention, nominated John C. Breckinridge, of Kentucky, and Joseph Lane, of Oregon; a third party, the so-called Constitutional Union party (q.v.), composed of conservative members of the old Whig and Know-Nothing parties, especially powerful in the South, nominated John Bell, of Tennessee, and Edward Everett, of Massachusetts; while the Republicans (see Republican Party) nominated Abraham Lincoln, of Illinois, and Hannibal Hamlin, of Maine. The Republican platform declared in favor of freedom in the Territories, a protective tariff, internal improvements, and a Pacific railway. In the ensuing election Lincoln received 180 electoral votes and was elected. He received every Northern vote in the electoral college, excepting three out of the seven cast by New Jersey. Breckinridge received 72 electoral votes of the South. Bell received the votes of Kentucky, Tennessee, and Virginia, 39 altogether. Douglas received only the nine votes of Missouri and three of the votes of New Jersey. The North and South were arrayed against each other, and the South was beaten. Of the popular vote, Lincoln received 1,866,452; Douglas, 1,375,157; Breckinridge, 847,953; Bell, 590,631. Thus, while Lincoln gained an overwhelming majority of the electoral votes, the combined Democratic votes exceeded his by 356,658, and the popular votes against him all together exceeded his own by 947,289. In the Southern States alone the combined vote of two of the Union candidates, Douglas and Bell, exceeded the vote of the disunion candidate, Breckinridge.

There was some ground for the claim that Lincoln was a "minority President," but the true significance of the election was the fact that political power had finally departed from the South. The slave States were at last confronted by an overwhelming opposition. The following figures from the census of each decade up to 1860 show the gradual growth of the power of the free States, the figures given for the slave States including the slaves:

YEAR	Free States	Slave States
1790	1,968,453	1,961,374
1800	2,684,616	2,621,316
1810	3,758,910	3,480,902
1820	5,152,372	4,485,819
1830	7,006,399	5,848,312
1840	9,733,922	7,334,433
1850	13,599,488	9,663,997
1860	19,128,418	*12,315,372

* Of these, about 3,500,000 were blacks.

The South lost no time in acting upon what many of her leaders had declared would be the

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*Cabinet.—*Secretary of State*, Lewis Cass, Michigan, March 6, 1857; J. S. Black, Pennsylvania, Dec. 17, 1860. *Secretary of the Treasury*, Howell Cobb, Georgia, March 6, 1857; Philip F. Thomas, Maryland, Dec. 12, 1860; John A. Dix, New York, Jan. 11, 1861. *Secretary of War*, John B. Floyd, Virginia, March 6, 1857; Joseph Holt, Kentucky, Jan. 18, 1861. *Secretary of the Navy*, Isaac Toucey, Connecticut, March 6, 1857. *Secretary of the Interior*, Jacob Thompson, Mississippi, March 6, 1857. *Attorney-General*, J. S. Black, Pennsylvania, March 6, 1857; E. M. Stanton, Pennsylvania, Dec. 20, 1860. *Postmaster-General*, Aaron V. Brown, Tennessee, March 6, 1857; Joseph Holt, Kentucky, March 14, 1859; Horatio King, Maine, Feb. 12, 1861.

signal of her withdrawal from the Union. President Buchanan's administration witnessed the culmination of the conflict that had for years been waged between the free States and the slave States. It was during this administration that the leaders of the South appear to have definitely decided that the welfare of their section could not be satisfactorily conserved while the Southern States remained a part of the Federal Union. Ever since the foundation of the government the statesmen of the South had for the most part maintained that theory of the Federal Constitution which regarded the ultimate sovereignty as residing not in the nation as a whole, but rather in the individual States themselves, which this theory—the theory of Calhoun and Hayne—held to be supreme and independent commonwealths. According to the view prevalent at the South these sovereign States had entered into a league of union with the other States for purposes of mutual advantage; and this partnership, like others, was to endure only as long as its original purpose was maintained with regard to all the members. Events seemed now to indicate that the time for the dissolution of the compact had arrived. In the first place the balance of political power was passing rapidly into the hands of a party inimical to the interests of the South, a party pledged to the ultimate abolition of slavery and to a commercial system of protection which was peculiarly unfavorable to an agricultural community such as the South then was. The greatest statesmen of the South had often deplored the presence of the slaves as an economic and social evil; yet, inasmuch as slavery actually existed, the question appeared to them a practical one rather than a matter of speculative interest. The abolitionists of the North had begun a crusade which, conducted with extreme bitterness and violence of denunciation, exasperated the South beyond measure. Men who believed thoroughly in the abstract wrongfulness of slavery indignantly took up its defense. The continual threats of the Southerners to destroy the Union, the attempts to carry out the Fugitive Slave Law, the violence to which so many of them were so ready to resort, as in the case of the assault upon Senator Sumner, and the high-handed proceedings that had marked the civil war in Kansas, all served to embitter and intensify the opposition at the North.

As soon as the result of the presidential election was known, the Legislature of South Carolina ordered a State convention, which on December 20 unanimously declared that "the Union now subsisting between South Carolina and other States, under the name of the United States, is hereby dissolved." The example of South Carolina was followed by Mississippi, Jan. 9, 1861; Florida, Jan. 10; Alabama, Jan. 11; Georgia, Jan. 19; and later by Louisiana, Texas, Virginia, Arkansas, North Carolina, and Tennessee. Kentucky and Missouri were divided.

On Feb. 4, 1861, delegates from seven seceding States met at Montgomery, Ala., and formed a provisional government, under the title of the Confederate States of America (q.v.). A provisional constitution was adopted similar in most respects to that of the United States, and the government formally inaugurated, Feb. 18, 1861, with Jefferson Davis, of Mississippi, as President, and Alexander H. Stephens, of Georgia, as Vice President, and on May 24, the seat of government was established at Richmond, Va. On the same day on which the Confederate delegates met at Montgomery a Peace Congress, in which 21 States were represented, assembled at Washington, but accomplished nothing. (See PEACE CONGRESS.) As State after State withdrew from the Union, its Senators and Representatives in Congress resigned their seats; and a large proportion of the officers of the army and navy of Southern birth, believing that their first and final allegiance was due to their State and that the action of each State carried with it all its citizens, also resigned their commissions.

President Buchanan, denying his constitutional power to compel the seceding States to return to the Union, though he believed that secession was unconstitutional, made a feeble and ineffectual attempt to relieve the garrison at Fort Sumter in Charleston harbor, closely besieged by the forces of South Carolina. Commissioners were sent by South Carolina to Washington to arrange for a transfer to the State of United States property lying therein and for a division of the national debt, but were not officially received. During all this time great efforts were made, but without result, to effect compromises of the difficulties. See CRITTENDEN COMPROMISE; PEACE CONGRESS.

Meanwhile, to the vacillation and incompetence of the President the prompt and vigorous action of the Southern leaders formed a striking contrast. By their direction armed forces were rapidly organized, United States arsenals and arms were seized, and batteries were planted for the reduction of such forts as threatened a firm resistance. In the last months, however, Buchanan's reorganized cabinet showed a much more determined front.

Among the events of Buchanan's administration were the Mormon Rebellion of 1857–58 (see MORMONS; MOUNTAIN MEADOWS MASSACRE), the disastrous financial panic of 1857, the discovery of silver and petroleum in the United States, and the congressional investigation of President Buchanan's connection with the Lecompton Bill (see COVODE INVESTIGATION).

XIX and XX. **Abraham Lincoln's** (1861–65) **and Andrew Johnson's** (1865–69) **Administration.*** On March 4, 1861, President Lincoln was inaugurated at Washington. In his inaugural address, he said: "I have no purpose, directly or indirectly, to interfere with the institution of slavery in the States where it exists. I believe that I have no lawful right to do so, and I have no inclination to do so." He also said, however: "The Union of these States is perpetual," and "No State upon its own mere motion can lawfully get out of the Union." The tension at the time was extreme and was not lessened by the vigorous efforts at conciliation which marked the

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*CABINET.—*Secretary of State*, William H. Seward, New York, March 5, 1861. *Secretary of the Treasury*, S. P. Chase, Ohio, March 5, 1861; W. P. Fessenden, Maine, July 1, 1864; Hugh McCulloch, Indiana, March 7, 1865. *Secretary of War*, Simon Cameron, Pennsylvania, March 5, 1861; Edwin M. Stanton, Pennsylvania, Jan. 15, 1862; U. S. Grant (ad interim), Aug. 12, 1867; Edwin M. Stanton (reinstated), Jan. 14, 1868; J. M. Schofield, New York, May 28, 1868. *Secretary of the Navy*, Gideon Welles, Connecticut, March 5, 1861. *Secretary of the Interior*, Caleb P. Smith, March 5, 1861; John P. Usher, Indiana, Jan. 8, 1863; James Harlan, Iowa, May 15, 1865; O. H. Browning, Illinois, July 27, 1866. *Attorney-General*, Edward Bates, Missouri, March 5, 1861; Titian J. Coffee, June 22, 1863; James Speed, Kentucky, Dec. 2, 1864; Henry Stanbery, Ohio, July 23, 1866; William M. Evarts, New York, July 15, 1868. *Postmaster-General*, Montgomery Blair, Maryland, March 5, 1861; William Dennison, Ohio, Sept. 24, 1864; Alexander W. Randall, Wisconsin, July 25, 1866.

first month of his administration; and the feelings of the whole Northern people were inflamed by the bombardment on April 12–13 and the enforced surrender on April 14 of Fort Sumter in Charleston harbor. (See FORT SUMTER.) On April 15 President Lincoln called for 75,000 three months' volunteers, large numbers of whom were in a few days marching to the defense of Washington. After the battle of Bull Run on July 21 (see BULL RUN, FIRST BATTLE OF) Congress voted to call out 500,000 men.

On Jan. 1, 1862, the United States had about 576,000 men in the field, and the Confederates had about 350,000. For numbers engaged and an account of the military operations, see CIVIL WAR and separate articles on the various battles; and for an account of the Confederacy, see CONFEDERATE STATES OF AMERICA.

On July 1, 1862, the President called for 300,000 three years' men, and on August 4 for 300,000 nine months' militia for the Federal army. The United States Congress passed an Act on Aug. 6, 1861, freeing all slaves used by Confederates in military operations in the Confederacy; in April, 1862, purchased and emancipated all slaves in the District of Columbia; and on June 9, 1862, abolished slavery throughout the public domain. July 17, 1862, a second Confiscation Act followed, which it was thought might free fugitives who reached the Union lines. On Jan. 1, 1863, President Lincoln issued a proclamation in pursuance of a prior proclamation issued on Sept. 22, 1862, after the battle of Antietam (q.v.), declaring the freedom of all the slaves in the rebellious States. (See EMANCIPATION, PROCLAMATION OF.) The suspension of the writ of habeas corpus (q.v.), the frequent seizure of newspapers, the dispersion of public meetings, and the imprisonment without trial of opponents of the government of the North, were generally recognized as essential to the security of the nation, although the introduction of such practices gave rise to sharp criticism of the administration and furnished the opponents of its policy with ample opportunity for partisan attacks. (See VALLANDIGHAM, C. L.; MILLIGAN, EX PARTE.) The unanimity of the North was also somewhat affected by great peace meetings, while the disturbed state of the public feeling was increased by the terrible draft riots in New York in July, 1863. (See DRAFT RIOTS IN NEW YORK.) Business conditions became unstable, as many banks had been forced to suspend specie payments, the paper money of the United States having largely depreciated. Nevertheless, the strength of the government was not seriously impaired, the appropriations of Congress in 1863 amounting to $972,000,000. In February of this year was passed the National Banking Act. The Confederates were cut off from all foreign aid, except such as could come to them through the blockade, and their own resources, both of men and material, in both of which respects the North was vastly superior, gradually became exhausted. The Southern railways had been in large measure destroyed or seized by the Federal troops, and it became difficult to transport supplies and to feed armies, while the North had the additional advantage of command of the sea and access to foreign markets.

In January, 1864, the United States had nearly 975,000 men raised and provided for; the entire Confederate forces probably numbered about 470,000. On April 9, 1865, the main Confederate army, under General Lee, surrendered to General Grant at Appomattox Court House. On April 26 General Johnston surrendered to General Sherman in North Carolina; and with the surrender of Kirby Smith in Texas, on May 26, the war was over.

In 1864 Lincoln had been reëlected President and Andrew Johnson, of Tennessee, elected Vice President. The Democratic party had nominated Gen. George B. McClellan, of New Jersey, and George H. Pendleton, of Ohio, on a platform which declared the conduct of the war a failure. Lincoln received 212 electoral votes, and McClellan 21, though the disparity between the popular votes was relatively much less, Lincoln receiving (counting the votes cast by soldiers in the field) 2,330,552 and McClellan 1,835,985. Only New Jersey, Delaware, and Kentucky were carried by the Democrats. West Virginia had been admitted to the Union, June 19, 1863. See WEST VIRGINIA.

On April 14, 1865, while the North was rejoicing over the capture of Richmond and the surrender of General Lee, President Lincoln was assassinated at Ford's Theatre in Washington, by John Wilkes Booth (q.v.), while an accomplice attacked and severely injured Seward, the Secretary of State. Andrew Johnson thus became President.

The Thirteenth Amendment to the Constitution, forever abolishing slavery in the States and Territories of the Union, was declared ratified by two-thirds of the States, Dec. 18, 1865.

The termination of the war imposed upon Congress and the executive the duty of reconstructing the governments of the States that had seceded. This now became the most important question before the national government and for a decade dominated national politics. During Johnson's administration it involved a bitter struggle between the President and Congress, which culminated in the resolution of the House of Representatives, Feb. 24, 1868, to impeach him "of high crimes and misdemeanors." (See JOHNSON, ANDREW; RECONSTRUCTION.) The immediate occasion of the passage of this resolution was the course of President Johnson in violating the Tenure of Office Act (q.v.), which made requisite the consent of the Senate to removals from office by the President, and of which Congress availed itself to prevent the removal of Stanton from the position of Secretary of War. The Senate acted as the court of impeachment, and on March 23, 1868, the Chief Justice presiding, proceeded to try Andrew Johnson on 11 articles of impeachment. The result was his acquittal, the prosecution lacking the necessary two-thirds majority. It was not until 1868 that the States of Arkansas, Alabama, Florida, North and South Carolina, Georgia, and Louisiana, were readmitted into the Union. On March 1, 1867, Nebraska had been admitted as a new State. About the same time Alaska was sold to the United States by Russia.

At the election of 1868 the Republican candidates were Ulysses S. Grant, of Illinois, and Schuyler Colfax, of Indiana. The Democrats nominated Horatio Seymour, of New York, and Francis P. Blair, Jr., of Missouri. Grant and Colfax received 214 electoral votes, and Seymour and Blair 80, the Democrats having carried eight States. In this year the Fourteenth Amendment was proclaimed a part of the fundamental law. On Feb. 27, 1869, the Fifteenth Amendment to the Constitution, guaranteeing the right of suffrage without regard to race, color, or previous condition of servitude, passed Congress and was ratified March 30, 1870.

XXI and XXII. **Ulysses S. Grant's Administration.**[*] (1869–77.) One of the most important events of President Grant's administration was the meeting of the Joint High Commission, appointed to consider the *Alabama* case (see ALABAMA CLAIMS), and which concluded the Treaty of Washington (q.v.), ratified by the Senate May 24, 1871.

Among other notable occurrences during this administration was the completion in May, 1869, of the Union and Central Pacific railroads, begun in 1865, providing a continuous line of railway from the Missouri to the Pacific and completing the transcontinental system. Out of the connection of the government with the construction of these roads—the government having given valuable subsidies in land and money to the constructing companies—arose the Crédit Mobilier scandal, which involved the reputation of many prominent officials and members of Congress. (See CRÉDIT MOBILIER OF AMERICA.) Tales of Southern outrages inflicted upon the freedmen, particularly in regard to the exercise by the latter of their newly acquired right of suffrage, attracted public attention (1868–72) until Congress intervened by legislation and passed several coercive acts, among which were the Enforcement Act of 1870 and the Ku-Klux Klan Act of 1871. (See KU-KLUX KLAN; RECONSTRUCTION.) Disputes arose in several of the States over contested elections, and the President intervened in Louisiana, in 1872–73, by sending Federal troops to that State, to bring about an adjustment of the difficulty, the troops supporting the Republican candidate for Governor and installing him in office. (See LOUISIANA.) In this and other instances, as well as in the suppression of the Ku-Klux Klan, the President was considered by many to have acted with undue severity towards the South. A movement was made by the government at the desire of President Grant in the direction of the acquisition of Santo Domingo, the people of that country desiring annexation to the United States, but the project was defeated in the Senate. In March, 1871, the first steps were taken towards the reform of the civil service by a bill authorizing the President to appoint a board of Civil Service Commissioners to provide for the appointment of applicants for minor offices on the basis of an examination.

During General Grant's first administration a new party arose as the result of a reaction against the extreme centralization of power in the Federal government due to the exigencies of war. This party was known as the Liberal Republican party and numbered among its adherents some of the most prominent names in the old Republican party, such as Horace Greeley (q.v.), Charles Francis Adams, Charles Sumner, and Carl Schurz. This party nominated, in 1872, Horace Greeley, of New York, for President, and B. Gratz Brown, of Missouri, for Vice President, on a platform deprecating any further interference by the government in the local affairs of the South. (See LIBERAL REPUBLICAN PARTY; REPUBLICAN PARTY.) This ticket was ratified by the convention of the Democratic party held in the same year. The Republicans renominated General Grant, with Henry Wilson (q.v.), of Massachusetts, for Vice President. The Republican ticket received 286 electoral votes, against 66 scattering, Greeley having died before the Electoral College met. Of the popular votes Grant received 3,597,132, Greeley 2,834,125. In this election appeared for the first time the Prohibition party and a Labor Reform party, the latter being an expression of a significant movement among workingmen which began during this administration and led in 1869 to the first attempt in the United States to organize on a permanent basis all kinds of manual labor. The votes of Louisiana and Arkansas and three votes from Georgia were not counted.

A serious difficulty with Spain arose because of the seizure on Oct. 31, 1872, by the Spanish steamer *Tornado* of the *Virginius*, a filibustering vessel flying the American flag, and the execution of part of her crew. See VIRGINIUS MASSACRE.

In 1873–74 the party known as Grangers or Patrons of Husbandry (see GRANGE) rose into some prominence; an Act for the resumption in 1897 of specie payments was passed in January, 1875; and an extensive Whisky Ring involving a corrupt association among distillers and Federal officers to defraud the government of the tax on liquors was exposed in the same year. (See WHISKY RING.) A new coinage Act, since denounced by advocates of free silver as the "crime of 1873," was passed providing for the coinage of gold and of fractional silver currency; an Act known as the "salary grab" was passed in 1873; and much local disorder occurred in the Southern States between the so-called "carpet-bag" governments and the white citizens, Grant interfering in what many considered a harsh and arbitrary manner. During Grant's second administration occurred the disastrous financial panic of 1873. A movement for the inflation of the paper currency was set on foot, and was checked by President Grant through his veto of the so-called Inflation Bill, which had been passed by Congress. This administration was disturbed by wars with the Modocs and Sioux, the latter of whom overwhelmed General Custer's command in 1876. (See CUSTER, GEORGE A.) In Philadelphia, between May and November, 1876, was held a mammoth exposition to commemorate the centennial of American independence. See CENTENNIAL EXHIBITION.

With Grant's administration of affairs much dissatisfaction was felt throughout the country, owing to corruption on the part of high government officials. Before the close of his first term there were many signs of reaction against Republican rule, and the organization of the Liberal Republican party showed the disaffection of a considerable element in the Republican party itself. By the close of his second term a well-defined and powerful opposition had arisen, based primarily on the President's apparent severity towards the South; on legislative scandals, such as the Crédit Mobilier affair and the "salary grab" scandal in Congress; the Whisky Ring scandal and the impeachment for corruption in distributing patronage of Belknap, Secretary of War, who resigned rather than submit to a trial; and on alleged general administrative demoralization, caused in part at least by the President's appointment, upon the advice of political leaders, of a number of unfit officials. Further discontent was caused by the consequences of the disastrous panic of 1873, for which, as was inevitable, the administration was held by many in a measure accountable. Many War Democrats, moreover, who had lent their support to the Republican party when the prosecution of the war was the all-absorbing issue, now began to return to their old party affiliations and to emphasize issues different from those immediately involved in the Republican war policy.

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[*] CABINET.—*Secretary of State*, E. B. Washburne, Illinois, March 5, 1869; Hamilton Fish, New York, March 11, 1869. *Secretary of the Treasury*, George S. Boutwell, Massachusetts, March 11, 1869; William A. Richardson, Massachusetts, March 17, 1873; Benjamin H. Bristow, Kentucky, June 2, 1874; Lot M. Morrill, Maine, June 21, 1876. *Secretary of War*, John A. Rawlins, Illinois, March 11, 1869; William T. Sherman, Ohio, Sept. 9, 1869; William W. Belknap, Iowa, Oct. 25, 1869; Alphonso Taft, Ohio, March 8, 1876; J. D. Cameron, Pennsylvania, May 22, 1876. *Secretary of the Navy*, Adolph E. Borie, Pennsylvania, March 5, 1869; George M. Robeson, New Jersey, June 25, 1869. *Secretary of the Interior*, Jacob D. Cox, Ohio, March 5, 1869; Columbus Delano, Ohio, Nov. 1, 1870; Zachariah Chandler, Michigan, Oct. 19, 1875. *Attorney-General*, E. R. Hoar, Massachusetts, March 5, 1869; Amos T. Akerman, Georgia, June 23, 1870; George H. Williams, Oregon, Dec. 14,1871; Edwards Pierrepont, New York, April 26, 1875; Alphonso Taft, Ohio, May 22, 1876. *Postmaster-General*, J. A. J. Creswell, Maryland, March 5, 1869; Marshall Jewell, Connecticut, Aug. 24, 1874; James M. Tyner, Indiana, July 12, 1876.

Colorado was admitted as a State, Aug. 1, 1876. In 1876 the Republican candidates were Rutherford B. Hayes, of Ohio, and William A. Wheeler, of New York; the Democratic candidates were Samuel J. Tilden, of New York, and Thomas A. Hendricks, of Indiana. On the face of the returns, Tilden and Hendricks seemed to have 184 electoral votes to 172 for Hayes and Wheeler, with the votes of Florida, South Carolina, and Louisiana, and one vote of Oregon in doubt. Charges were made of fraudulent voting in several States; party feeling ran so high as to suggest the possibility of acts of violence to secure control of the government; and all the attendant circumstances made the struggle one of the most momentous since the foundation of the government. Hayes and Wheeler were finally declared elected by an Electoral Commission chosen from both Houses of Congress and from the Supreme Court of the United States, whose decision was accepted by all concerned as final and irrevocable. (See ELECTORAL COMMISSION.) As thus finally decided, 185 electoral votes were given to Hayes and Wheeler and 184 votes to Tilden and Hendricks.

XXIII. **Rutherford B. Hayes's Administration.**[*] (1877–81.) The early portion of this administration was made memorable by the troubles in South Carolina and Louisiana, where rival State governments, each claiming to be legally elected, contended for supremacy. In the former State the difficulty was settled by President Hayes, who ordered the withdrawal of the United States troops which had been stationed at Columbia and had been an objectionable feature of the contest; whereupon the Republican Governor, Chamberlain, retired, and Gen. Wade Hampton took peaceful possession of the office. A settlement was also effected in Louisiana, a commission being sent thither by the President, when the Democratic Governor, Nicholls, was enabled to gain possession of his seat, the Federal troops being in this instance also withdrawn from New Orleans. This marked the end of Federal interference in the local concerns of the Southern States, an interference that had become yearly more objectionable to moderate men at the North, who no longer cherished the animosities resulting from the Civil War.

This year was further noteworthy by the occurrence, in July, of railroad strikes and riots throughout the country, to the injury of business and with serious loss of property. (See STRIKES AND LOCKOUTS.) The excitement occasioned by the near approach of the period fixed by Congress for the resumption of specie payments led to the formation of a party opposed to the prevailing sentiment with regard to financial questions. Such a party was organized in Toledo, Ohio, Feb. 22, 1878, under the name of the National party, delegates being present from 28 States; its principles included bimetallism, the suppression of national-bank issues, a graduated income tax, and opposition to Chinese labor. In the State elections of the same year this party, which became popularly known as the Greenback party (q.v.), polled upward of a million votes.

In February, 1878, the dissatisfaction which had been felt by the advocates of silver coinage with the Act of 1873 suspending the coinage of silver except for subsidiary coins, found expression in the passage by Congress, over the President's veto, of the so-called Bland-Allison Bill, which provided for the annual purchase by the Secretary of the Treasury of at least $2,000,000 worth[*] of silver bullion to be coined into legal-tender dollars, each containing 412½ grains of standard silver. On Jan. 1, 1879, specie payments were resumed throughout the United States, after a suspension of 17 years, and in accordance with the Act of Congress approved Jan. 14, 1875, the process of resumption being effected without excitement.

An extraordinary movement northward of the colored population from certain of the Southern States took place in 1879 and was the source of much uneasiness among the planters. (See NEGRO EXODUS.) This year also saw the decline and fall of the labor agitation in San Francisco, which under the leadership of Denis Kearney (q.v.) had been continued with great virulence since 1877.

On June 2, 1880, the Republican National Convention met in Chicago to nominate candidates for President and Vice President. The names most prominent before this convention were those of Ulysses S. Grant, James G. Blaine, and John Sherman. The final choice, however, was James A. Garfield, of Ohio, with Chester A. Arthur, of New York, for Vice President. On June 11 the Greenback National Convention met in Chicago and nominated for President James B. Weaver, who was afterward accepted as the candidate of the Socialist party. On June 22 the Democratic National Convention assembled at Cincinnati, Ohio, and nominated Winfield S. Hancock, of Pennsylvania, and William H. English, of Indiana. The result of the election was the choice of Garfield and Arthur, who received 214 electoral votes, against 155 votes cast for Hancock and English.

XXIV. **James A. Garfield's** (1881) **and Chester A. Arthur's Administration.**[†] (1881–

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[*] CABINET.—*Secretary of State*, William M. Evarts, New York, March 12, 1877. *Secretary of the Treasury*, John Sherman, Ohio, March 8, 1877. *Secretary of War*, George W. McCrary, Iowa, March 12, 1877; Alexander Ramsey, Minnesota, Dec. 12, 1879. *Secretary of the Navy*, Richard W. Thompson, Indiana, March 12, 1877; Nathan Goff, Jr., West Virginia, Jan. 6, 1881. *Secretary of the Interior*, Carl Schurz, Missouri, March 12, 1877. *Attorney-General*, Charles Devens, Massachusetts, March 12, 1877. *Postmaster-General*, David M. Key, Tennessee, March 12, 1877; Horace Maynard, Tennessee, Aug. 25, 1880.

[*] He could buy as much as four million dollars' worth if he so desired.

[†] CABINET.—*Secretary of State*, James G. Blaine, Maine, March 5, 1881; Frederick T. Frelinghuysen, New Jersey, Dec. 12, 1881. *Secretary of the Treasury*, William H. Windom, Minnesota, March 5, 1881; Charles J. Folger, New York,

85.) The politicians in the Republican party who had favored the election of General Grant for a third term of the presidency, popularly known, particularly in New York, as Stalwarts, had not been pleased with the nomination of Garfield, and in the presidential campaign they had been induced to give his candidacy their support only on a general understanding that the candidate if successful would give them a liberal share of patronage. The new President had in various ways shown his desire to conciliate both wings of the party; he had held many conferences with the leaders of each, and his first nominations were apparently dictated by a desire to conciliate the Stalwarts. But his appointment of William H. Robertson, who had been instrumental in securing the President's nomination at Chicago, to the post of Collector of the Port of New York aroused the opposition of the Senator from that State, Roscoe Conkling (q.v.), a leading Stalwart. Finding that his opposition was ineffectual, Conkling and his colleague, Thomas C. Platt (q.v.), resigned their seats in the Senate, May 16, 1881, and appealed to the New York Legislature for reëlection as a justification of their course. The appeal was unsuccessful, and a bitter contest, lasting until the latter part of July, ended with the election of Miller and Lapham to the Senate. Meanwhile the President's appointments had been confirmed. The new Postmaster-General had discovered colossal frauds in the Star Route Service of the Postal Department, and an effort was made to bring the criminals to justice. (See STAR ROUTE FRAUDS.) The diplomacy of Secretary Blaine in regard to the war between Chile and Peru and the Panama Canal (q.v.) excited considerable newspaper criticism.

On July 2 President Garfield was shot by an assassin, a disappointed office seeker, Charles J. Guiteau, and after lingering for 79 days between life and death died, on September 19, at Elberon, N. J. (See GARFIELD, JAMES A.) On the same day in New York Vice President Arthur took the oath of office as President.

Among the national events of 1882 were the passage by Congress of the Anti-Polygamy Bill, March 22; the Apportionment Bill, increasing the number of congressional Representatives to 325; and the Anti-Chinese Bill, suspending Chinese immigration for 20 years. The last was vetoed by the President, who, however, signed a subsequent bill limiting the term of suspension to 10 years. Among the several State elections of this year, one at least had a national significance. In New York the lukewarmness of that wing of the Republican party which had sympathized with General Garfield in his contest with the leaders of the faction to which Arthur was allied, and the indignation of the Independents at the political methods pursued by President Arthur to secure the nomination and election of his friend, Charles J. Folger, as Governor of the State, resulted in the election of the Democratic candidate, Grover Cleveland (q.v.), by the immense majority of 192,000 votes. The victory of the Democrats in Pennsylvania was also looked upon as to some extent a rebuke of the administration and especially of machine methods in politics. The question of civil service reform was now pressed with renewed eagerness by its advocates; and the so-called Pendleton Bill, which had already passed the Senate, passed the House in January, 1883, and was signed by the President. See CIVIL-SERVICE REFORM.

The Republican National Convention of 1884 met in Chicago during the first week of June, and the fourth ballot resulted in the nomination of James G. Blaine (q.v.) for the presidency, and of John A. Logan, of Illinois, for the vice presidency. The nomination of Blaine was secured in spite of bitter organized opposition of the Independent faction in the Republican party, popularly known as Mugwumps (q.v.). The papers which represented the views of the Independents withheld their support from Blaine and indicated that they would cast their influence on the side of the Democratic candidate in case some statesman of tried incorruptibility were chosen by the Democratic convention. It was generally understood that either Grover Cleveland or Thomas F. Bayard would be acceptable to them. When the convention met in July these two were the leading candidates on the first ballot. On the second ballot Cleveland secured the necessary two-thirds majority and was declared the nominee. Thomas A. Hendricks, of Indiana, was nominated for Vice President. Tickets were put in the field by the Prohibitionists (see PROHIBITION), who nominated John P. St. John, of Kansas, for President, and William Daniel, of Maryland, for Vice President; and by the Anti-Monopoly and Greenback Labor parties, both of which nominated Gen. Benjamin F. Butler (q.v.), of Massachusetts, for President. The campaign which followed developed unusual excitement, party rancor, and personal recrimination. The election was unexpectedly close, and the result for a few days hung in doubt over conflicting returns in the pivotal State of New York; but the official count gave a plurality of 1047 to Cleveland, who received 219 electoral votes, while Blaine received 182, and a popular vote of 4,874,986, while Blaine received 4,851,981. St. John had a popular vote of 150,369, and Butler a popular vote of 175,370.

XXV. **Grover Cleveland's Administration.**[*] (1885–89.) Cleveland was the first Democratic President to be chosen after the election of 1856. He was pledged to support civil-service reform. For the most part the recently established classified service was not interfered with, but partisan removals were pretty freely made in the unclassified service.

In 1886 a bill passed Congress to regulate the succession to the presidential office—a question that assumed some special importance on the death of Vice President Hendricks. Among the important congressional acts of this administration were the new Anti-Polygamy or the Ed-

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Oct. 27, 1881. *Secretary of War*, Robert T. Lincoln, Illinois, March 5, 1881. *Secretary of the Navy*, W. H. Hunt, Louisiana, March 5, 1881; William E. Chandler, New Hampshire, April 12, 1882. *Secretary of the Interior*, S. J. Kirkwood, Iowa, March 5, 1881; Henry M. Teller, Colorado, April 6, 1882. *Attorney-General*, Wayne MacVeagh, Pennsylvania, March 5, 1881; Benjamin H. Brewster, Pennsylvania, Dec. 16, 1881. *Postmaster-General*, Thomas L. James, New York, March 5, 1881; Timothy O. Howe, Wisconsin, Dec. 20, 1881; W. Q. Gresham, Indiana, April 3, 1883; Frank Hatton, Iowa, Oct. 14, 1884.

[*] CABINET.—*Secretary of State*, Thomas F. Bayard, Delaware, March 6, 1885. *Secretary of the Treasury*, Daniel Manning, New York, March 6, 1885; Charles S. Fairchild, New York, April 1, 1887. *Secretary of War*, William C. Endicott, Massachusetts, March 6, 1885. *Secretary of the Navy*, William C. Whitney, New York, March 6, 1885. *Secretary of the Interior*, Lucius Q. C. Lamar, Mississippi, March 6, 1885; William F. Vilas, Wisconsin, Jan. 16, 1888. *Attorney-General*, Augustus H. Garland, Arkansas, March 6, 1885. *Postmaster-General*, William F. Vilas, Wisconsin, March 6, 1885; Don M. Dickinson, Michigan, Jan. 16, 1888.

munds-Tucker Act (1887) dissolving the Mormon church as a corporate body and confiscating all the property of that church in excess of $50,000; the Interstate Commerce Act (q.v.) of 1887; and an Act in 1885 barring laborers brought into the United States under contract. With respect to legislation President Cleveland's administration was characterized by an unprecedented number of presidential vetoes, the number aggregating more than 300, mostly of pension bills.

In December, 1887, President Cleveland sent to Congress a message devoted to the single question of the tariff. After stating that the estimated surplus in the Treasury in June, 1888, would be fully $140,000,000, he declared the existing tariff laws to be the source of unnecessary taxation and asked for a reduction of the duties on raw materials, especially on wool. In accordance with this recommendation the so-called Mills Bill was introduced and passed the House. It removed duties aggregating $50,000,000 per annum, but failed to pass the Senate, which was Republican. At this session of Congress the largest appropriation for rivers and harbors ever known was made ($22,227,000). It became law without the President's signature.

At the Democratic Convention of 1888 Cleveland was nominated for President, with Allen G. Thurman, of Ohio, as the candidate for Vice President. The Republicans nominated Benjamin Harrison, of Indiana, and Levi P. Morton, of New York. The Prohibition party candidates were Clinton B. Fisk, of New Jersey, and John A. Brooks, of Missouri. The campaign was fought out largely on the tariff questions raised by Cleveland's message of 1887. The election resulted in the choice of the Republican candidates, who received 233 electoral votes, as against 168 cast for the Democratic nominees, the popular vote for Cleveland, however (5,540,329), exceeding that of Harrison (5,439,853). The Prohibition ticket received 249,406 votes, and the Union Labor candidate, Alson J. Streeter, 146,935 votes.

XXVI. **Benjamin Harrison's Administration.*** (1889–93.) The administration of Harrison witnessed a remarkable growth of public interest in the foreign relations of the United States, both commercially and otherwise. One cause of this is to be found in the meeting of the so-called Pan-American Congress at Washington, Oct. 21, 1889, under the presidency of Secretary Blaine, which did much to foster a popular sentiment in favor of commercial reciprocity between the United States and the other American republics. This policy, warmly advocated by Blaine, found expression in the so-called "reciprocity section" of the important bill for the revision of the tariff prepared by William McKinley (q.v.), of Ohio, which passed both Houses of Congress and became a law Oct. 1, 1890. For other provisions of the bill, see TARIFF.

Several diplomatic difficulties of more or less seriousness had arisen between the United States and foreign Powers within a few years. Among these had been complications growing out of a state of anarchy on the Isthmus of Panama, the United States government, in accordance with its treaty obligations, being required to send an armed force to protect the isthmus. A dispute with Germany over the Samoan Islands (q.v.) in 1889 had also taken a serious aspect, though finally arranged in an amicable manner by a treaty signed at Berlin (Feb. 4, 1890). A serious disagreement with England also arose in 1890–91 regarding the rights of the United States acquired in Bering Sea by treaty with Russia, and was referred to arbitration in 1891. The question was finally settled in 1893. (See BERING SEA CONTROVERSY.) The lynching of several Italians by a mob in New Orleans in 1891 led to something like a diplomatic rupture with Italy, which recalled its Minister from Washington. In October, 1891, difficulties arose with Chile in consequence of a murderous assault upon American seamen in Valparaiso.

In November, 1889, four States (North Dakota, South Dakota, Montana, and Washington) were admitted into the Union. On May 2, 1890, the new Territory of Oklahoma (q.v.) was organized, and Idaho (July 3) and Wyoming (July 11) were admitted as States. Other events of importance during Harrison's administration were the passage in 1890 of the Dependent Pension Bill, which nearly doubled the number of pensioners; the repeal of the Bland-Allison Silver Coinage Act; the passage of the Sherman Silver Purchase and Coinage Act, requiring the Secretary of the Treasury to purchase 4,500,000 ounces of silver each month and to coin 2,000,000 ounces into silver dollars each month until July 1, 1891; and the labor disturbances at Homestead, Pa.

The close of Harrison's administration witnessed a serious financial panic. An event of international importance was the overthrow of the monarchy in Hawaii by the foreign residents, and the application made by the new government for annexation of the islands to the United States. The President sent a treaty of annexation to the Senate (February, 1893), but it was not acted upon. See HAWAIIAN ISLANDS.

The conventions of the two great political parties had been held in June, 1892. The Democrats nominated Grover Cleveland, of New York, for the presidency, and Adlai E. Stevenson, of Illinois, for the vice presidency. The Republican Convention renominated President Harrison for the presidency and selected Whitelaw Reid, of New York, for the vice presidency. The People's party, or Populists, nominated Generals J. B. Weaver, of Iowa, and James G. Field, of Virginia. The ensuing campaign was largely conducted on the question of the tariff and resulted in the election of Cleveland and Stevenson, who received 277 electoral votes as against 145 for Harrison and Reid and 22 for Weaver and Field.

XXVII. **Grover Cleveland's Second Administration.*** (1893–97.) In his second administration the President applied himself particularly to the promotion of tariff and financial reforms, and this period was marked by the intense and persistent opposition of his own party in both Houses of Congress. His earliest act of importance was the withdrawal from the Senate of the treaty for the annexation of Hawaii to the United States, which had been negotiated in the closing days of the previous administration. He also sent James H. Blount, ex-Congressman from Georgia, to Hawaii as a special commissioner to investigate the circumstances of the overthrow of the royal government, and on his report took the ground that the United States government had through its representatives committed a grievous wrong against the Kingdom. See HAWAIIAN ISLANDS.

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* CABINET.—*Secretary of State*, James G. Blaine, Maine, March 7, 1889; John W. Foster, Indiana, June 29, 1892; W. F. Wharton, Massachusetts, Feb. 23, 1893. *Secretary of the Treasury*, William Windom, Minnesota, March 7, 1889; Charles Foster, Ohio, Feb. 21, 1891. *Secretary of War*, Redfield Proctor, Vermont, March 7, 1889. *Attorney-General*, W. H. H. Miller, Indiana, March 7, 1889. *Postmaster-General*, John Wanamaker, Pennsylvania, March 7, 1889. *Secretary of the Navy*, Benjamin F. Tracy, New York, March 7, 1889. *Secretary of the Interior*, John W. Noble, Missouri, March 7, 1889. *Secretary of Agriculture*, Jeremiah M. Rusk, Wisconsin, March 7, 1889.

* CABINET.—*Secretary of State*, Walter Q. Gresham, Indiana, March 6, 1893; Richard Olney, Massachusetts, June 10, 1895. *Secretary of the Treasury*, John G. Carlisle, Kentucky, March 6, 1893. *Secretary of War*, Daniel S. Lamont, New York, March 6, 1893. *Secretary of the Navy*, Hilary A. Herbert, Alabama, March 6, 1893. *Secretary of the Interior*, Hoke Smith, Georgia, March 6, 1893. *Attorney-General*, Richard Olney, Massachusetts, March 6, 1893; Judson Harmon, Ohio, June 8, 1895. *Postmaster-General*, Wilson S. Bissell, New York, March 6, 1893; William L. Wilson, West Virginia, March, 1895. *Secretary of Agriculture*, J. Sterling Morton, Nebraska, March 6, 1893.

The legislation on the tariff was the most important domestic incident of this term. A new bill, bearing the name of Chairman Wilson, of the House Committee on Ways and Means, and providing for free raw sugar, free wool, free coal, free lumber, and free iron ore, and reducing the duties on many articles in the existing schedules, was introduced Dec. 19, 1893. In the following month a measure providing for an income tax was presented in the House, and that and others concerning the internal revenue were incorporated in the bill during the subsequent debate. When the bill reached the Senate it underwent radical alterations, many amendments being made, notably those imposing a duty on sugar, coal, and iron ore, and the House at first refused to concur in the Senate amendments. Finally, however, it withdrew from its position of nonconcurrence, and the bill was passed. (See TARIFF.) The President allowed the bill to become a law without his signature. On an appeal to the United States Supreme Court, that body, April 2, 1893, declared two provisions of the income-tax law unconstitutional and upheld the remainder by a tie vote, and on May 20, on a rehearing, declared the whole measure unconstitutional.

Early in the term occurred the great commercial panic of 1893, which was followed by a long period of depression. President Cleveland was determined to maintain the gold standard and in the summer of that year called an extra session of Congress in order to secure the repeal of the Sherman Act of 1890. This he accomplished in the face of great opposition. In January, 1894, because of the heavy withdrawal of gold coin from the Treasury and the large reduction in the gold reserve of $100,000,000, Secretary Carlisle, of the Treasury Department, invited proposals for the purchase of $50,000,000 of 5 per cent bonds, and this sale resulted in the acquisition of $58,660,917 in gold, which was added to the reserve. The drain on the reserve, however, continued, and in November following the Secretary issued a second call for the purchase of $50,000,000 bonds, when the subscriptions aggregated $178,341,150 and the sale yielded $58,538,500 in gold, which brought the reserve to $111,142,021. In about two months after this sale the reserve declined to $41,340,181. The President, in a special message to Congress, Jan. 28, 1895, recommended that authority be given the Secretary of the Treasury to issue bonds bearing a low rate of interest, to maintain the reserve and redeem outstanding notes issued for the purchase of silver; but Congress did not approve the recommendation. Secretary Carlisle then signed a contract with New York bankers to supply the government with 3,500,000 ounces of standard gold coin, at the rate of $17.80441 per ounce, for 30-year 4 per cent bonds, on condition that one-half of the coin should be obtained in Europe, and that if Congress should authorize their issue, bonds payable in gold and bearing 3 per cent interest might within ten days be substituted at par for the 4 per cent bonds. The President again urged Congress to authorize the issue of low-rate bonds, declaring in his message that more than $16,000,000 in interest would be saved thereby, and Congress again withheld its sanction. Under the contract the Secretary sold $62,315,000 in bonds for a little over $65,000,000 in gold. The subscriptions to this loan aggregated $590,000,000 in London and $200,000,000 in New York. Under the continuance of the business depression Secretary Carlisle was forced early in 1896 to sell $100,000,000 of 30-year 4 per cent bonds.

The silver question came up again in Congress, Feb. 7, 1894, when the House Committee on Coinage, Weights, and Measures reported a bill directing the coinage of the silver held in the Treasury. A substitute by Congressman Bland providing for the coinage of the seigniorage was adopted and passed in the House and the Senate. This bill was vetoed by the President, and it failed of passage over the veto. In December, 1895, the House passed a bond bill prepared by the Republican members of its Committee on Ways and Means, and when it reached the Senate the Finance Committee reported a free-silver-coinage substitute, which the Senate passed, Feb. 1, 1896, by a vote of 42 yeas to 35 nays. The House refused to concur in the substitute and rejected it by a vote of 215 yeas to 90 nays. A few days afterward the Senate defeated the Emergency Revenue Bill, prepared by Republican members of the House Committee on Ways and Means.

A long-standing dispute between Venezuela and Great Britain, over the boundary line between Venezuela and British Guiana, was the cause of a presidential message to Congress in December, 1895, recommending the appointment of a commission to determine this boundary line. This message, on account of its sharp and determined tone towards Great Britain, created a great sensation. Both Houses unanimously concurred in the recommendation, and a commission was appointed Jan. 1, 1896. (See VENEZUELA.) Among other events of President Cleveland's second administration were the World's Columbian Exposition at Chicago, the settlement of the Bering Sea controversy (q.v.) in 1893, the signing of treaties with China and Japan in 1894, the extension by the President of civil-service reform (q.v.), the calling out of Federal troops to protect government property and the mails against strikers at Chicago in 1894, the admission of Utah into the Union in 1896, and the arbitration by the President of disputes between Brazil and the Argentine Republic, Colombia and Italy, and Brazil and Italy.

The presidential campaign of 1896 turned principally on the Democratic demand for the free coinage of silver at the ratio of 16 to 1. There were seven tickets in the field, viz., the Republican (sound money), William McKinley, of Ohio, and Garret A. Hobart, of New Jersey; the Democratic (free silver), William J. Bryan, of Nebraska, and Arthur Sewall, of Maine; the National Democratic (sound money), John M. Palmer, of Illinois, and Simon B. Buckner, of Kentucky; the Prohibition, Joshua Levering and Hale Johnson; the Socialist Labor, Charles H. Matchett and Matthew Maguire; the Populist, William J. Bryan and Thomas E. Watson; and the Free Silver Prohibition, Charles E. Bentley and James H. Southgate. The total popular vote was 13,930,942, and the electoral, 447, of which the Republican candidates received 7,104,779 and 271 respectively, and the Democratic, 6,502,925 and 176. The Populist ticket received 144,928 votes; National Democratic, 134,731; Prohibition, 123,428; Socialist Labor, 35,306; and Free Silver Prohibition, 13,535.

XXVIII and XXIX. **William McKinley's (1897–1901) and Theodore Roosevelt's Administration.**[*] (1901–09.) President McKinley's administration was concerned chiefly with the war against Spain and with problems growing out of the war and the acquisition of the Philippines and Porto Rico. These subjects are treated under SPANISH-AMERICAN WAR; CUBA; PHILIPPINE ISLANDS; PORTO RICO. The Spanish-American War, with its consequent acquisition of colonies and dependencies, marks a momentous epoch in the history of the United States. It brought the country into a more active contact with world politics; it caused a far greater activity in military preparation and national defense; it directed attention to the interests of colonizing nations and to international trade, opening up new commercial possibilities; it made the political and economic conditions of the Orient the concern of the United States; and it made imperative the construction of the Panama Canal. In the war there was a manifestation of the national unity which had already been achieved.

Congress and the Supreme Court successively held that constitutional did not necessarily follow colonial sovereignty, that acquired nationals did not become citizens of the United States with attendant rights. In the Insular cases (De Lima *v.* Bidwell, Downes *v.* Bidwell) the Supreme Court in 1900 decided that Porto Rico was not a "foreign country," but left the inference that Congress could regulate the tariff relations of dependencies, which the Foraker Act (April, 1900) forthwith regulated.

Under joint resolution of Congress Hawaii was annexed to the United States in 1898, and on June 14, 1900, the islands were organized into a Territory of the United States. See HAWAIIAN ISLANDS.

Owing to disturbances in Samoa in 1899, the existing joint protectorate was abandoned, and Tutuila (q.v.) and other minor islands passed (1900) under the sovereignty of the United States, Germany assuming like rights over Saraii and Upolu.

The organization of trusts continued with increasing rapidity. During the first four months of 1899 the capitalization of these trusts was $2,000,000,000 as against $1,000,000,000 in the preceding 12 months, and, in the years 1899–1901, 183 new trusts were organized with a total capitalization of $4,000,000,000. There developed a strong antitrust movement, which resulted in a large number of State laws regulating the formation and operation of large industrial combinations. In the case of United States *v.* Trans-Missouri Freight Association (1897) the Supreme Court forced the dissolution of a railroad association and gave an impetus to the antitrust movement. (See TRUSTS.) For the Boxer disturbances, see CHINA.

In 1900 occurred the Galveston flood, which resulted in great loss of life and in the new idea of municipal government—the commission form. At the Republican National Convention held on June 19 at Philadelphia President McKinley and Theodore Roosevelt were nominated by acclamation and the principles of 1896 reaffirmed. The nominee stood for prosperity, and the party for an alliance between business and politics. On July 4 the Democratic Convention at Kansas City nominated William J. Bryan and Adlai E. Stevenson and declared again for free silver and against imperialism and militarism. (See DEMOCRATIC PARTY.) The Democratic nominees received the indorsement of the Anti-Imperialist League, the Populist Fusionists, and the Silver Republicans. The election resulted in a complete victory for the Republicans, McKinley receiving 292 electoral votes and Bryan 155. The popular vote of the Republicans was 7,219,530 and that of the Democrats 6,358,071.

While receiving the people in the Temple of Music at the Pan-American Exposition at Buffalo, President McKinley was shot down by an anarchist, named Czolgosz (q.v.), on Sept. 6, 1901. After eight days of suffering the President died at Buffalo. Vice President Roosevelt took the oath of office. He retained the cabinet and announced his intention to continue the policy of the previous administration.

In 1900 a currency law was adopted, establishing the gold dollar as the standard of value in the United States. In 1901 the army (see *Army*) was reorganized and the canteen (q.v.) abolished. The Fifty-seventh Congress passed a new Chinese Exclusion Bill, and an Act for reclaiming and irrigating arid lands of the West. In 1902 the Census Office was made a permanent bureau. In 1903 a reciprocity treaty was concluded with Cuba. (See CUBA; PLATT, O. H.) In 1903 a new Department of Commerce and Labor was created, the Secretary being made a member of the cabinet. A Bureau of Manufactures and Corporations was established, with functions of investigation. Laws for the reorganization of the militia and increase of the navy were passed. A general staff for the army was created. In 1903 Wisconsin adopted the first State-wide primary-election law for the nomination of elective officials. By 1913 two-thirds of the States had adopted the principle in some form. In 1902 Oregon adopted the initiative and referendum, Montana in 1906, and Oklahoma in 1907.

A convention on the Isthmian question was ratified by Great Britain and the United States on Dec. 16, 1901. (See HAY-PAUNCEFOTE TREATY.) For an account of the relations between the United States and Colombia and the Republic of Panama, see PANAMA CANAL.

There occurred a number of strikes, a most noteworthy development of one being the appointment by the President in October, 1902, of a commission to arbitrate the differences between the striking anthracite miners of Pennsylvania and their employers which effected a settlement and averted a coal famine.

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[*] CABINET.—*Secretary of State*, John Sherman, Ohio, 1897; W. R. Day, Ohio, 1898; John Hay, Ohio, 1898; Elihu Root, New York, 1905; Robert Bacon, New York, 1909. *Secretary of the Treasury*, Lyman J. Gage, Illinois, 1897; Leslie M. Shaw, Iowa, 1901; George B. Cortelyou, New York, 1907. *Secretary of the Navy*, John D. Long, Massachusetts, 1897; William H. Moody, Massachusetts, 1902; Paul Morton, Illinois, 1904; C. J. Bonaparte, Maryland, 1905; V. H. Metcalf, California, 1907; T. H. Newberry, Michigan, 1908; *Secretary of War*, Russell A. Alger, Michigan, 1897; Elihu Root, New York, 1899; W. H. Taft, Ohio, 1904; Luke E. Wright, Tennessee, 1908. *Secretary of the Interior*, Cornelius N. Bliss, New York, 1897; E. A. Hitchcock, Missouri, 1899; James R. Garfield, Ohio, 1907. *Postmaster-General*, James A. Gary, Maryland, 1897; Charles Emory Smith, Pennsylvania, 1898; Henry C. Payne, Wisconsin, 1901; Robert J. Wynne, Pennsylvania, 1904; George B. Cortelyou, New York, 1905; George von L. Meyer, Massachusetts, 1907. *Attorney-General*, Joseph McKenna, California, 1897; J. W. Griggs, New Jersey, 1897; Philander C. Knox, Pennsylvania, 1901; William H. Moody, Massachusetts, 1904; Charles J. Bonaparte, Maryland, 1907. *Secretary of Agriculture*, James Wilson, Iowa, 1897. *Secretary of Commerce and Labor*, George B. Cortelyou, New York, 1903; Victor H. Metcalf, California, 1904; Oscar S. Straus, New York, 1907.

After tedious negotiations, in January, 1903, Secretary Hay and the British Ambassador signed a convention for the settlement of the Alaskan boundary dispute providing for its reference to a tribunal of six jurists. On Oct. 17, 1903, the tribunal decided the main points of the controversy in favor of the United States, the decision being signed by the three American arbitrators, Lodge, Root, and Turner, and by the English arbitrator, Lord Alverstone. The refusal of the two Canadian members to agree with the majority was strongly approved in Canada, where the decision was received with marked evidences of dissatisfaction.

In the presidential election of 1904 the Republicans were again successful, and President Roosevelt was elected by an enormous majority of electoral votes (336 to 140). The Republican National Convention met at Chicago, nominated Theodore Roosevelt for the presidency and Charles W. Fairbanks for the vice presidency, and adopted a platform eulogizing the administration and reaffirming the principles of the previous platforms of 1896 and 1900. The Democratic National Convention met at St. Louis, and its sessions were marked by a bitter contest between the conservative wing and the radical wing, which latter had been dominant in 1896 and 1900. The former triumphed, and a platform was adopted which (as a concession to the radicals) was silent on the "gold standard," arraigned the Republican administration as being "spasmodic, erratic, sensational, spectacular, and arbitrary," declared against imperialism, protection, and "executive usurpation," and advocated reciprocity and "the election of United States Senators by direct vote of the people." Alton B. Parker, of New York, was nominated for the presidency, and Henry G. Davis, of West Virginia, for the vice presidency. Other parties nominated candidates for President and Vice President as follows: Socialist, Eugene V. Debs, of Indiana, and Benjamin Hanford, of New York; Prohibitionist, Silas C. Swallow, of Pennsylvania, and George W. Carroll, of Texas; People's, Thomas E. Watson, of Georgia, and Thomas H. Tibbles, of Nebraska; Socialist Labor, Charles H. Corrigan, of New York, and William W. Cox, of Illinois. The record of President Roosevelt since his accession to the presidency was the principal issue. The popular vote was as follows: Republican, 7,628,834; Democratic, 5,084,491; Socialist, 402,460; Prohibitionist, 259,257; People's, 114,753; Socialist Labor, 33,724. Parker carried only the Solid South, Missouri excepted.

President Roosevelt's administration was marked by the especial activity of the Federal government against combinations in restraint of trade, discriminations by interstate carriers, and the payment by railroads of rebates to favored shippers. The Bureau of Corporations and Manufactures and the Interstate Commerce Commission conducted investigations into the management of various corporations. As a result suits were brought by the government, and the Northern Securities Company, a holding company for the Great Northern and Northern Pacific railroads, was declared illegal and dissolved by the Supreme Court in 1904, and the Beef Trust was declared illegal in 1905. On March 12, 1906, the Supreme Court decided that in antitrust proceedings witnesses might be compelled to testify against their own corporations; in August the Standard Oil Company was indicted in Chicago and in New York for receiving rebates and for accepting illegal concessions in railroad rates; and in October the New York Central and Hudson River Railroad was convicted in New York of granting illegal rebates. Other similar convictions were secured.

The sessions of the Fifty-ninth Congress were marked by important legislation. The Hepburn Rate Bill for the regulation of railroads and conferring power of rate making (subject to review of the courts) upon the Interstate Commerce Commission became a law on June 29, 1906; and on June 30 a rigid meat-inspection bill, passed to make a continuation of the revolting conditions in the Chicago packing houses impossible, and a pure-food bill were signed, the last going into effect on Jan. 1, 1907.

Other legislation of importance for 1906–07 may be briefly summarized: Alaska was allowed a delegate in Congress; a Bureau of Immigration was established; naturalization was made uniform; Japanese immigration was restricted; national-bank liabilities were limited to 30 per cent of capital; salaries of Vice President, cabinet members, and Speaker were increased to $12,000 and those of Congressmen to $7500; corporations and national banks were forbidden to contribute to campaign funds, the Aldrich-Vreeland Act (1908) provided for a monetary commission and allowed banks to issue notes on State, county, or municipal bonds and to form associations for issuance of notes on commercial paper; the consular service was reorganized.

In April, 1906, occurred the San Francisco earthquake and in August the Brownsville Affair, in which negro soldiers were involved and a racial question presented in politics by their dismissal by President Roosevelt.

Through the President's good offices a meeting of Russian and Japanese peace commissioners at Portsmouth, N. H., was brought about, and a treaty of peace was concluded on Sept. 5, 1905; a Pan-American Conference in which the United States participated was held at Rio de Janeiro, Brazil. (See ROOT, ELIHU.) Owing to an insurrection in Cuba, the United States intervened, restored order, and on Sept. 29, 1906, established a provisional government, Secretary of War Taft acting as provisional Governor until succeeded on October 13 by Charles F. Magoon. In February, 1907, the treaty with Santo Domingo was ratified whereby United States officers were to collect customs revenues and pay Dominican foreign debts.

On Nov. 30, 1908, the Root-Takahira note set at rest some of the fears that relations with Japan might become hostile. It stated, following treaties between Japan and England, France and Russia, that the policy of both governments looked towards peace, the maintenance of the status quo in the Pacific Ocean and the Orient and of the "open door" in China, and pledged both governments to mutual consultation before these policies should be changed.

Roosevelt's administration was also a period of constant agitation of reform questions in which he and Republican conservatives became alienated. The President's attitude became sharp and bitter, and opposition to him became more virulent. The House generally followed him, but the Senate sought to check what many thought his overreaching ambition. Certain developments in the struggle seemed to prove that many conservative Senators were identified with the moneyed interests, that the powerful party organization in the Senate was formed in the interests of the trusts. The results were that many of the Roosevelt policies were ignored by Congress and that there arose a demand for the popular election of Senators.

It was generally known that President Roosevelt favored Secretary of War Taft as his successor. His indorsement and assistance greatly aided Taft's candidacy, which was opposed only by "favorite sons" in New York, Pennsylvania, Indiana, and Illinois. The Republican National Convention met at Chicago, where Taft was nominated for the presidency and James S. Sherman, of New York, for the vice presidency on first ballots. The platform emphatically indorsed the administrations of Roosevelt and declared for postal-savings-bank system, for conservation, and for a downward revision of the tariff with the imposition of such "duties as will equal the differences between the cost of production at home and abroad, together with a reasonable profit to American industries." Public opinion was equally certain as to the outcome of the Democratic Convention, which met at Denver. The overwhelming defeat of the conservatives in 1904 and the reawakened consciousness of the necessity for internal reform caused the party to turn to its old radical leader, William J. Bryan. He was nominated on the first ballot, and J. W. Kern, of Indiana, was selected for the vice presidency. The platform was a reassertion of Bryan principles, a denunciation of Republican abuses, and a demand for divorce of business and politics, for a diminution of the powers of the Speaker of the House of Representatives, for a revision of the tariff, and for a Federal license for corporations which prohibited duplication of directors. The Socialists nominated Eugene V. Debs, of Indiana, and Benjamin Hanford, of New York; the Socialist Labor, A. Gilhaus, of New York, and D. L. Munro, of Virginia; the Prohibitionists, E. W. Chafin, of Illinois, and A. S. Watkins, of Ohio; the Populists, Thomas E. Watson, of Georgia, and S. W. Williams, of Indiana; the Independence League, T. L. Hisgen, of Massachusetts, and J. T. Graves, of Georgia. The campaign was unexciting, and, although the reception of Bryan was enthusiastic, it was generally thought that Taft would be elected. The vote in the Electoral College for Taft was 321 to 162 for Bryan, and the popular vote was 7,679,006 for Taft to 6,409,106 for Bryan.

XXX. William Howard Taft's Administration.* (1909–13.) In accordance with the promise of the platform President Taft after his inauguration summoned the Congress into extraordinary session to revise the tariff. The framers, Payne and Aldrich, were leaders of the conservative, "stand-pat" element of the party in the House and Senate respectively, and the bill showed their opposition to any violent change in the policy of protection. As finally adopted (August 5), the Payne-Aldrich Law reduced 654 rates, increased 220, and left 1150 unchanged. The Law provided for the establishment of a tariff board to investigate the operation of the measure and to recommend changes, for a tax of 1 per cent upon incomes of corporations earning above $5000 net, and for free trade with the Philippines. Much against the wishes of the insurgent Western leaders and admitting that the Act did not strictly comply with the pledges, Taft approved it. Although the President in a speech at Winona, Minn., stated that the Act was the best tariff law his party had ever adopted, the general opinion was that the conservatives had triumphed and that the wishes of the people had not been regarded. Whether he desired or not, the President became identified with the conservatives, and the Ballinger-Pinchot (qq.v.) controversy (August, 1909) seemed to confirm this association. See CONSERVATION.

In 1910, through a coalition of Democrats and insurgents, the power of Speaker Cannon to control the Rules Committee and debate in general was broken in a dramatic parliamentary struggle. A resolution, introduced March 10, provided for the elimination of the Speaker from the committee and the appointment of it by the House.

The important measures of the regular session, passed in 1910, may be summarized as follows: a Commerce Court was established to pass upon cases investigated by the Interstate Commerce Commission; a postal-savings-bank system was created; the publication of campaign expenses in Federal elections was required; the powers of the Interstate Commerce Commission were enlarged in a new railroad bill; the Mann "White Slave" Act was adopted; and in 1911 a limit was placed on contributions to campaign funds for Congressmen.

The division in the Republican party was further intensified by the ill-concealed sympathy of Roosevelt, who had returned from Africa on March 21, 1910, for the radical insurgents. (See ROOSEVELT.) Owing to this widening breach, to the development of new leaders, and the widespread discontent with the tariff law, the Democrats, in the election of 1910, won a notable victory, carrying the House by a majority of 66 and increasing their membership in the Senate from 32 to 41. The Democrats in the House of Representatives made a fundamental change in procedure by having committee members elected by the House on nomination of the Committee on Ways and Means.

On Jan. 26, 1911, the President submitted the outline of the Canadian Reciprocity Treaty which he had negotiated in an attempt to conform to his tariff pledges. It provided for lower duties on many food products and some manufactured articles, and it became a popular measure. For success, however, it soon developed that it depended upon Democratic votes in both Chambers. Congress, in extra session, passed the Reciprocity Bill on July 22. At the same time the Democratic party, led with skill by Oscar W. Underwood and aided by the insurgents, adopted tariff bills revising several schedules, viz., the Farmer's Free List, the Wool Bill, and the Cotton Bill, all of which were vetoed by the President on the ground that they were not scientifically drafted on the recommendation of the tariff board. Taft's hopes for Canadian reciprocity were blasted when, on September 21, Canada defeated ratification. The conservatives were further weakened before the public by the Lorimer scandal. (See LORIMER.) Charged with use of bribery in securing his election, he was exonerated in 1911, but in 1912 his seat

* CABINET.—*Secretary of State*, P. C. Knox, Pennsylvania, 1909. *Secretary of the Treasurer*, Franklin MacVeagh, Illinois, 1909. *Secretary of War*, J. M. Dickinson, Tennessee, 1909; H. L. Stimson, New York, 1911. *Secretary of the Navy*, George von L. Meyer, Massachusetts, 1909. *Secretary of the Interior*, R. A. Ballinger, Washington, 1909; W. L. Fisher, Illinois, 1911. *Postmaster-General*, F. H. Hitchcock, Massachusetts, 1909. *Attorney-General*, G. W. Wickersham, New York, 1909. *Secretary of Agriculture*, James Wilson, Iowa, 1909. *Secretary of Commerce and Labor*, Charles Nagel, Missouri, 1909.

was declared vacant. This scandal, the popular disapproval of the obstructive methods of the conservative Senate, and the prolonged deadlocks in several State Legislatures where Senators were to be elected, gave such an impetus to the demand for the popular election of Senators that a constitutional amendment (the Seventeenth) to that effect was submitted (1912) to the States and ratified (1913). In 1913, also, the States ratified the Sixteenth Amendment (submitted 1911), granting authority to Congress to enact income-tax laws, which had been recommended by Taft in 1909.

In 1911 the Supreme Court gave important decisions holding that the Standard Oil and American Tobacco companies had conducted their business in unreasonable and undue restraint of trade and that they should be dissolved into their original, constituent elements. In 1911, also, Senator Aldrich submitted the plan of the monetary commission for currency reform, providing for the Federal incorporation of a Reserve Association with $300,000,000 capitalization. Favored by most bankers, it was suspiciously opposed by the public because of the dominance of private control provided in the scheme.

Important legislation of the Sixty-first Congress may be mentioned as follows: an Act for the government of the Panama Canal zone provided for the exemption from tolls of American ships engaged in coastwise trade; an Act providing civil government for Alaska; New Mexico and Arizona were admitted as separate States (1912); an Immigration Law having a literacy test was vetoed by the President; a Law creating the Department of Labor with a secretary of cabinet rank was adopted (1913); and the Commerce Court was destroyed by withholding maintenance funds (1913). During this Congress there were numerous investigations, such as that of the Money Trust, the Shipping Trust, and the Steel Trust. See PUJO; TRUSTS.

In 1909 the United States forces of occupation were withdrawn from Cuba, and the civil government surrendered in accordance with promises. In that year, also, the long-standing differences with Venezuela were peacefully settled in that the Gómez government, more amenable than that of the deposed Castro, agreed to a reference to The Hague for arbitration. Diplomatic intercourse between the two countries was resumed. The United States was greatly aroused, in December, 1909, over the execution of two Americans by the Zelaya government of Nicaragua, against which a successful revolution was being waged.

In 1910 Secretary Knox proposed to the various nations the establishment of a permanent court of arbitral justice at The Hague. At the same time he and the President were negotiating arbitration treaties with the principal European nations. Those with Great Britain and France attracted wide attention, for they provided for peace and arbitration of any questions "justiciable in their nature" that might arise. These treaties, signed Aug. 3, 1911, enlisted the enthusiastic support of the President, who spoke for them while on tour, but they were not satisfactory to the Senate, where they were thought to deprive it of its constitutional right in ratifying treaties. The treaty had provided that in case of disagreement as to whether or not a matter was subject to arbitration the question should be placed before a joint commission and the matter submitted to arbitration or not, according to its decision. Striking out this article, the treaties were ratified March 7, 1912.

In September, 1912, the Alsop claims between United States and Chile were decided. In December, 1911, the subsisting treaty of 1832 with Russia was abrogated, because of the disregard by Russia of American passports issued to naturalized Jews. From 1910 to 1913 President Taft was greatly concerned with the complications arising from the revolutions in Mexico against Díaz and later Madero. Large forces of American soldiers were detailed to patrol the border and maintain neutrality, and warships were sent to many of the Mexican harbors. The administration was opposed to intervention, but still sought to protect American interests and lives. Finally, in March, 1912, Congress authorized the President to place an embargo on the shipment of arms across the border into Mexico. Taft declined to recognize the Huerta government, which succeeded that of Madero in February, 1913.

In 1912 there was a rumor that Mexico was about to sell a portion of Magdalena Bay territory to Japanese interests. This led to the adoption of the Lodge Resolution in July, which effected an extension of the Monroe Doctrine to the effect that the United States would oppose the selling by American nations of lands to foreign corporations which might be used as naval bases to threaten the communications and safety of the United States.

Secretary Knox, with respect to the Orient, insisted on the maintenance of the "open door" policy and secured in 1912 the right of the United States financiers to participate in a proposed loan to China and in the financing of projected railways.

In the presidential campaign of 1912 three Republicans were prominent in seeking the nomination, Taft, Roosevelt, and La Follette (qq.v.). The last, though at first supported by Roosevelt, was eliminated by illness, unpopularity in the East, and by Roosevelt's candidacy. In the preconvention contest for delegates preferential primaries were used in many States for the first time for the selection of delegates, and in all but three of such States Roosevelt was successful. The convention met at Chicago, where the contested seats were largely decided in favor of Taft delegates. (See ROOT; ROSEWATER.) Roosevelt declared the decisions were a "clear steal," and most of his followers declined to take part in the balloting. Taft was nominated on the first ballot, and James S. Sherman was renominated for Vice President. The situation in the Democratic party was even more confused. Speaker Champ Clark, of Missouri, Gov. Judson Harmon, of Ohio, Gov. Woodrow Wilson, of New Jersey, and Representative Oscar W. Underwood, of Alabama, among others were the most prominent candidates. The convention met at Baltimore, where a dramatic contest took place between the conservatives, led by A. B. Parker, and the progressives, led by Bryan. The conservatives elected Parker temporary chairman, but the radicals elected the permanent chairman, Ollie James. At first no one had a majority, and a two-thirds majority was required. On the forty-sixth ballot Woodrow Wilson, who after New York began to vote for Clark had the strong personal support of Bryan, was nominated. His immediate nomination was probably caused by the threat of Bryan to force a referendum to the people. Thomas R. Marshall, of Indiana, was named for Vice President. Roosevelt left the Republican party and rapidly organized a new one, the Progressive, and at Chicago in August received the nomination for the presidency. Hiram W. Johnson, of California, was nominated for Vice President. The Socialist party at Indianapolis named Eugene V. Debs, of Illinois, and Emil Seidel, of Wisconsin; the Socialist Labor, A. E. Reimer, of Massachusetts, and August Gilhous, of New York; the Prohibitionists, E. W. Chafin, of Illinois, and A. S. Watkins, of Ohio. The platforms did not differ radically as to specific recommendations, and on principles the Republicans and Progressives did not widely differ as to public economics, nor the Democrats and Progressives as to social reform. The campaign abounded in bitter attacks on Roosevelt and emphatic replies from him. The election occurred November 5 and resulted in the choice of Wilson. The popular vote was 6,286,214 for Wilson, 4,126,020 for Roosevelt, 3,483,922 for Taft, 897,011 for Debs, and 208,923 for Chafin. A remarkable development of the voting was the increase of Socialist strength. It more than doubled its 1908 record, rising from 402,460 to 897,011. The electoral vote was 435 for Wilson, 88 for Roosevelt, and 8 for Taft. The Democrats also secured the House by a majority of 120 over all parties and the Senate by 7. See Democratic, Republican, and Progressive parties.

XXXI. **Woodrow Wilson's Administration.**[*] (1913–). Shortly after his induction into office President Wilson called the Congress into extraordinary session to revise the tariff. The event of its meeting was signalized by a return to the custom of Washington and Adams of addressing the Houses in person. The Democrats promptly organized themselves into an efficient machine, headed by Speaker Clark and Leader Underwood in the House and Simmons and Kern in the Senate. The new Tariff Act was drafted by Underwood and Simmons and was passed October 3. The bill was an effort to return to a revenue tariff on the one hand and an effort to prevent business disturbance on the other. On a rough average duties were reduced to a 20 per cent basis, and a provision was made for free sugar within three years. The duty was continued in 1916, the revenue being needed. To take the place of the revenue lost because of the new sugar schedule, an income tax was made a part of the tariff law. The progressive principle was employed in that incomes above $4000 ($3000 for unmarried persons) were taxed 1 per cent, $30,000 to $50,000 2 per cent, above $75,000 3 per cent, above $100,000 4 per cent, and so on until those above $500,000 were taxed 7 per cent. Despite the purpose mentioned there occurred in 1913–14 a serious business depression, and the protectionists promptly asserted that the measure was a failure. Congress was at the same time considering the problem of currency reform, and the Glass-Owen Bill was framed, which, with an important amendment suggested by Root requiring a gold reserve, effected changes of far-reaching consequence. See Reserve Bank, Federal.

During 1913 foreign relations occupied a large share of the President's attention—as they did throughout the administration—and many problems of delicate nature were confronted. The Mexican problem early became embarrassing. Wilson refused to recognize Huerta as the head of a de facto government, largely on account of the moral principle that the latter was a usurper who had connived at the murder of Madero. Although the embargo on arms was continued, Huerta was unable to secure loans; and the revolution of the Constitutionalists, led by Carranza and Villa, gathered force. (See Mexico; Huerta; Villa.) Relations with Japan were also strained by the passage of laws by the State of California prohibiting the ownership of lands by aliens who could not be naturalized. Japan protested against the discrimination and the violation of treaty rights, and the President sent Secretary of State Bryan to California in an effort to secure a change in the State legislation without success. The countries exchanged notes, and a modus vivendi was finally arranged whereby the United States agreed to test the laws in the courts, and Japan made promises as to future immigration. On May 2 Wilson recognized the Republic of China, having previously advised American bankers not to participate in the international railway loans. In March he announced to Latin American countries which had been suffering from revolutions that the United States would support only "the orderly processes of just government, based upon law, not upon arbitrary or irregular force." Conditions in Nicaragua (q.v.) finally resulted in the conclusion of a treaty which virtually established an American protectorate on the principle of the Platt Amendment. In December, 1913, Wilson delivered a special message on the Mexican situation in which he stated that there could be no peace until Huerta was eliminated. Observing that the revolution was succeeding, he thought that Huerta would soon be crushed and saw no reason why we should be obliged "to alter our policy of watchful waiting." At the same time the Hay Volunteer Bill was enacted providing for an emergency volunteer army of 242,000 men.

Meanwhile Congress was considering the recommendations of the President relative to trust legislation and rural credits. Of five proposed bills two became law, the Interstate Trade Commission Bill, Sept. 8, and the Clayton Anti-Trust Act, Oct. 8, 1914. The first provided for a commission of five members with powers of investigation, supervision, and prevention of unfair competition; the latter embodied the ideas of the Democrats on the trust problem. (See Trusts.) It prohibited interlocking directorates and forbade the use of injunctions in labor disputes. Prior to the adoption of these acts the President had secured another victory in the repeal of the Panama Canal Tolls legislation. The issue had arisen because of the protest of Great Britain that the Hay-Pauncefote Treaty had been violated. The President in a special message asked for the repeal on the grounds that the law was a mistaken economic policy, a contravention of treaty obligations, and that the repeal would aid him in the conduct of foreign affairs. With these acts adopted a remarkable legislative record was completed, and Congress adjourned after the longest continuous session within the history of the country.

The situation as to foreign affairs in 1914 had become increasingly acute. On February 3 the

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[*] Cabinet.—*Secretary of State*, William J. Bryan, Nebraska, 1913; Robert Lansing, New York, 1915. *Secretary of the Treasury*, W. G. McAdoo, New York, 1913. *Secretary of War*, L. M. Garrison, New Jersey, 1913; Newton D. Baker, Ohio, 1916. *Secretary of the Navy*, Josephus Daniels, North Carolina, 1913. *Secretary of the Interior*, Franklin K. Lane, California, 1913. *Postmaster-General*, A. S. Burleson, Texas, 1913. *Attorney-General*, J. C. McReynolds, Tennessee, 1913; Thos. W. Gregory, Texas, 1914. *Secretary of Agriculture*, D. F. Houston, Missouri, 1913. *Secretary of Commerce*, W. C. Redfield, New York, 1913. *Secretary of Labor*, W. B. Wilson, Pennsylvania, 1913.

President had lifted the embargo on the shipment of arms into Mexico, and the revolutionists had purchased large amounts of munitions, enabling them to make substantial progress against Huerta. On April 9 occurred the Tampico incident, which involved the arrest by a Huertista officer of some United States marines while on a peaceful errand to buy gasoline and supplies. Rear Admiral Mayo demanded their surrender, an apology, and a salute to the United States flag. Strained negotiations followed in which Huerta refused to comply with the demand for the salute, in which Wilson had supported Mayo. On April 20 the President asked authority from Congress to employ the military and naval forces to exact reparation. It was granted, and in pursuance of it Vera Cruz was occupied after 18 men were killed. Although the cause seemed trivial and the method to involve complications, intervention found ready support, though many urged that it should have been on the grounds of protection to American lives and property. The administration, on the contrary, had warned Americans to leave Mexico, and funds had been appropriated for the purpose of aiding them. While plans were being made for the invasion of Mexico, Wilson accepted the good offices of Argentina, Brazil, and Chile, and agreed to appoint commissioners to meet at Niagara Falls to discuss ways of effecting peace and the settlement of the Mexican problem. While the commissioners were meeting, Huerta, having suffered defeat, resigned and left the government to Carbajal, who in turn relinquished it to Carranza. The forces of the United States were withdrawn from Vera Cruz (November, 1914). A treaty was negotiated with Colombia in an attempt to settle her grievances, in which it was stipulated that the United States pay $25,000,000 and give certain concessions. The Senate postponed consideration of it. During the year 20 peace and arbitration treaties were negotiated, of which 18 were ratified.

The European War, in which the United States promptly declared its neutrality, had immediate important economic and legislative effects in the United States. (See War in Europe.) In August a bill was passed admitting foreign-built ships to the American registry with certain restrictions as to coastwise trade. A War Risk Insurance Act was adopted providing for emergency insurance for ships. It was promptly seen that the stopping of a large part of the imports would curtail the revenues and produce a deficit. To prevent this development an emergency revenue bill was passed providing for an increased internal-revenue taxation system.

The election of 1914 had for its issues the new tariff law and the record of the President. The Democrats were successful in retaining their majorities in Congress, but they were reduced in the House, the vote being Democrats 232, Republicans 194, and Progressives 7. In the Senate the Democrats were increased to 53 and the opposition reduced to 43.

The war brought great increase in the export trade, especially in foodstuffs and munitions, most of the former and practically all of the latter going to the Allies, since German shipping had been largely withdrawn from the seas. The great demand caused the available shipping to be overtaxed, and the President introduced in December, 1914, a request for a Ship Purchase Bill. The proposition evoked such opposition that the Republicans, in February, 1915, in a prolonged filibuster aided by seven Democrats, defeated the measure. In this the President experienced his first serious defeat in Congress.

In the European War there had developed something of a deadlock, and both sides resorted to indirect methods of inflicting injury. The United States was almost in the situation which existed prior to the War of 1812, and intricate complications developed with both Germany and Great Britain. To the one Secretary Bryan sent a note declaring that the United States would hold Germany to a "strict accountability," and to the other a firm protest against the prevention of legitimate American trade by means of illegal blockade and vexatious delays in prize procedures. Deep irritation had been caused by the destruction of the steamer *Gulflight* by a German submarine and by the seizure of the *Wilhelmina* and *Dacia* by Great Britain and France. The United States, however, was horrified when the *Lusitania*, on May 7, without warning was torpedoed by a submarine, when more than 1000 persons, including 114 Americans, lost their lives. On May 13 Wilson sent a strong note to Germany demanding a disavowal of the act, indemnity for the violation of American rights, and stating that the United States stood firmly on the ground that Americans had the right to travel on merchant ships of belligerent nationality. Relations between the two countries reached the breaking point, and many expected and desired war. A large party developed in the country urging military preparation to meet complications which might involve it in war. Attention was directed towards the large number of Americans of German birth and descent who thought that the United States should preserve true neutrality by prohibiting the export of munitions to the Allies exclusively. They emphasized the trade restrictions of Great Britain and alleged that Germany was being deprived of food for its civil population. Notes were interchanged, the tone of the American communications becoming more insistent, until on September 1 Germany declared that liners were not to be sunk without warning. Despite the fact that the cases of the *Nebraskan* and the *Arabic* (disavowed October 5) had arisen and depended on separate negotiations, this announcement was regarded as a Wilson victory. There remained the necessity for Germany to disavow the destruction of the *Lusitania* and indemnify American citizens. Wilson's position in the correspondence with Germany had caused the resignation of Secretary Bryan (June), who thought that his ideas might lead to war and who urged that Americans should be warned to remain off passenger ships of the warring nations. In the meanwhile the indignation among German sympathizers respecting the supply of munitions to the Allies caused many to plan the disturbance of labor by bringing about strikes. Plots were formed, it was alleged, and executed involving the explosion of bombs in factories and the destruction of many munition plants. It was established that the Austrian Ambassador, Dumba, was implicated, and his recall was demanded (September 9). Attachés, Boy-Ed and Von Papen, of the German Embassy, had a similar fate on December 3.

During the short session of Congress an immigration bill was adopted (1915), with a literacy test included, which the President vetoed. In June, 1915, the Supreme Court rendered two important decisions, deciding against the government in the dissolution suit against the Steel Trust and, secondly, that the grandfather clauses of the Oklahoma and Maryland constitutions were void.

On May 24, 1915, a Pan-American Financial Conference was held at Washington to effect a closer economic coöperation in the Western Hemisphere. On August 9 the United States decided to intervene in Haiti, and on September 16 it was agreed that the United States should supervise Haitian finances very much as was done in the case of Santo Domingo. In October Secretary Lansing called a conference of certain South American diplomats on the Mexican question. It was decided that Carranza had established himself more firmly, was about to defeat Villa, and that he was deserving of recognition. On October 19, therefore, President Wilson recognized Carranza as heading the de facto government of Mexico and began to assist him in eliminating Villa.

In December, 1915, the President's message was almost wholly devoted to the championship of military preparedness, although the year before he had opposed those who would turn America into an armed camp, and at the opening of 1916 that appeared as the supreme issue in American politics. The fourth Pan-American Scientific Congress met in Washington in December, 1915, at which Secretary Lansing and many notable South Americans urged a Pan-American Union for political alliance and protection. In Congress the Mexican policy was attacked and defended, and resolutions were introduced imposing embargoes on trade in munitions. Complaints were made of British treatment. On preparedness all shades of opinion were apparent. Minority Leader Mann urged that the President be supported in nonpartisan spirit, while Majority Leader Kitchin opposed him.

In December, 1915, the sinking of the *Persia* in the Mediterranean Sea again brought the controversy over submarine warfare to the fore. While negotiations were still pending over this incident the channel boat *Sussex* was torpedoed with a loss of over 100 lives. This aroused considerable comment inasmuch as the *Sussex* was strictly a passenger vessel and unarmed. The question of arming merchantmen for defense presented a serious problem. A resolution warning Americans not to sail on armed merchantmen failed to pass both Houses of Congress, indicating that the President was to carry on foreign relations without interference from Congress. On April 14 the United States government demanded that submarine warfare, as it affected neutrals, be abandoned under a penalty of a break in diplomatic relations. See WAR IN EUROPE, *Neutrals*, for the German reply.

In January President Wilson nominated Louis D. Brandeis to the position of Justice of the Supreme Court. He had been prominent in inquiries into railroad conditions and in trust investigations. His nomination brought out a storm of protests from many prominent men, and the Senate appointed a committee to take testimony as to why Brandeis should or should not be appointed. Upon a favorable report from this committee (10 to 8) he was confirmed by the Senate in June, 1916, by a vote of 47 to 22. In February, 1916, Secretary of War Garrison resigned because he could not agree with President Wilson on the question of national defense. Newton D. Baker, of Cleveland, succeeded.

In the early part of 1916 the Mexican situation was considerably altered. In January Villista forces killed several American miners and the United States government demanded that the de facto government punish the guilty parties. On March 9 Villa with about 500 followers invaded the town of Columbus, N. Mex., killed 7 troopers and several civilians, and set fire to many buildings. When he fled he was pursued across the border by United States soldiers. The next day President Wilson ordered a punitive expedition to cross the border, with scrupulous respect for the sovereignty of the Mexican Republic. An agreement was made with General Carranza which permitted him to cross the United States border in pursuit of escaping bandits. A force under General Pershing with the coöperation of Carranza troops pushed Villa into the mountain regions of Chihuahua. Several desultory engagements were fought. At Parral United States soldiers were fired on by natives, and General Carranza demanded the recall of the punitive expedition. This was refused by the United States on the ground that the de facto government was not able to keep the peace along the border. A conference was held between representatives of the two governments to attempt to settle the question of border control, but as no definite agreement could be reached, the expeditionary force remained in Mexico to prevent further violations of the sovereignty of the United States. The State militia was called out to protect the border. In July, 1916, after an exchange of notes, negotiations were pending to settle the matter by a joint commission. In 1916 Charles E. Hughes and Woodrow Wilson were the candidates nominated for the Presidency by the Republican and Democratic Conventions respectively. Charles W. Fairbanks and Thomas R. Marshall were the vice-presidential nominees. See WILSON, WOODROW.

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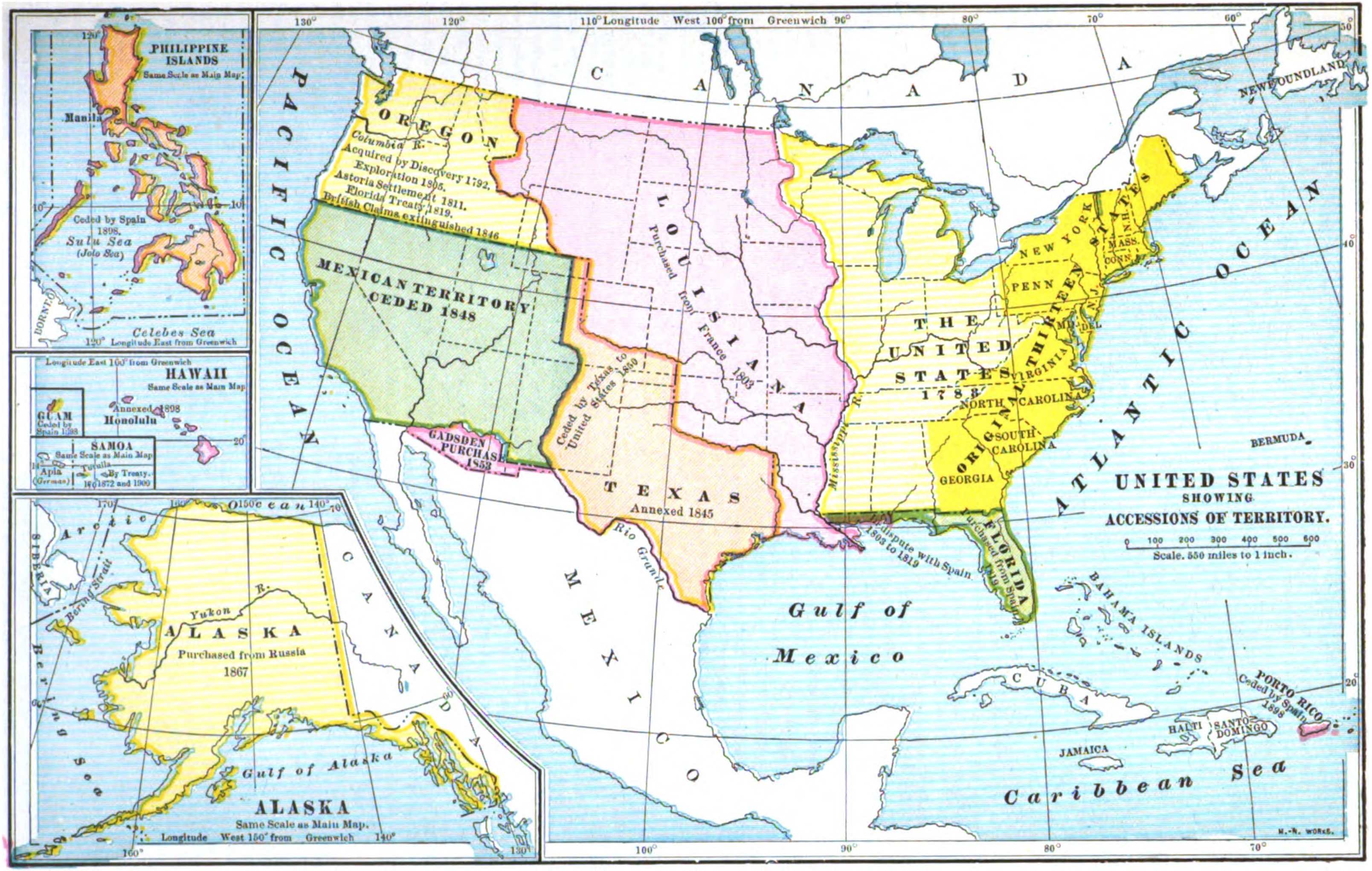
UNITED STATES, EXTENSION OF THE TERRITORY OF THE. Prior to 1781 only six of the 13 original States, viz., New Hampshire, Rhode Island, New Jersey, Pennsylvania, Maryland, and Delaware, had exactly defined boundaries. Of the remaining seven States, some claimed to extend to the Pacific Ocean, others to the Mississippi River. The States with inexact boundaries ceded to the general government their claims to lands west of their present limits in succession, as follows: March 1, 1781, New York; March 1, 1784, Virginia, the cession including the territory which now forms the State of Kentucky and the parts of the States of Ohio, Indiana, and Illinois which lie south of the forty-first parallel, Virginia, however, reserving from this cession for military-bounty lands the entire territory, 6570 square miles, between the Scioto and Little Miami rivers, from their sources to the Ohio River; April 19, 1785, Massachusetts, including her claims to territory west of the present boundary of New York; May 28, 1786, Connecticut, the cession being the territory west of the Alleghanies between the parallels of 41° and 42°, except a strip 120 miles in length lying directly west of Pennsylvania, retained for the benefit of her public schools, and later known as the Western Reserve (q.v.), which she ceded to the United States in 1800; Aug. 9, 1787, South Carolina, the territory ceded being a strip of land about 12 miles wide, south of the thirty-fifth parallel and extending along the southern boundaries of North Carolina and Tennessee to the Mississippi; Feb. 25, 1790, North Carolina, the territory ceded constituting what is now Tennessee; June 16, 1802, Georgia, after receiving that part of the cession of South Carolina lying within her present limits, ceding all between her present western boundary and the Mississippi, and between the South Carolina cession and the thirty-first parallel, embracing a large part of what is now Mississippi and Alabama. The foregoing cessions secured to the general government nearly all territory ceded by Great Britain, not included in the original 13 States, as in the main now bounded. On Nov. 25, 1850, the State of Texas ceded all her claims to lands west of the twenty-sixth meridian west of Washington (103d Greenwich) and between lat. 32° and 36° 30′.

Cessions by Foreign Powers. In the treaty of Sept. 3, 1783, with Great Britain the western limits of the United States were declared to be the Mississippi River to the thirty-first parallel. On April 30, 1803, by treaty with France, the Province of Louisiana was acquired. (See LOUISIANA PURCHASE.) Its western boundary as finally adjusted, Feb. 22, 1819, by treaty with Spain, ran up the Sabine River, to and along the seventeenth meridian (94th Greenwich), to and along the Red River, to and along the twenty-third meridian (100th Greenwich), to and along the Arkansas River, to and along the Rocky Mountains, to and along the twenty-ninth meridian (106th Greenwich), to and along the forty-second parallel, to the Pacific Ocean. Its northern boundary conformed to the boundary established between the British possessions and the United States. On the east it was bounded by the Mississippi as far south as the thirty-first parallel, where different boundaries were claimed. The United States construed the cession of France to include all the territory between the thirty-first parallel and the Gulf of Mexico, and between the Mississippi and Perdido, the latter of which is now the western boundary of Florida. Under this construction of the cession, the "Province of Louisiana" is now covered by those portions of the States of Alabama and Mississippi which lie south of the thirty-first parallel; by Louisiana, Arkansas, Missouri, Iowa, Minnesota west of the Mississippi, Kansas, Nebraska, North and South Dakota, Montana, Idaho, Oregon, Washington, and Oklahoma; and by the portion of Colorado lying east of the Rocky Mountains and north of the Arkansas River, and that portion of Wyoming lying east of the Rockies and south of the forty-second parallel. Spain, from which power France had acquired Louisiana by treaty in 1800 (see SAN ILDEFONSO, TREATY OF), claimed that she had ceded to France no territory east of the Mississippi except the "Island of New Orleans," and also contended that her Province of West Florida included all of the territory south of the thirty-first parallel and between the Perdido and Mississippi, except the "Island of New Orleans." Under this construction, the "Province of Louisiana" included on the east of the Mississippi only the territory bounded on the north and east by the "rivers Iberville and Amite and by the lakes Maurepas and Pontchartrain." By the treaty of 1803 the national territory was increased by 1,171,931 square miles. The extreme northwestern portion of this territory was claimed by Great Britain, with which power the United States concluded the Northwest Boundary Treaty in 1846. By the treaty of Feb. 22, 1819, Spain formally ceded the territory now covered by Florida, by those portions of Alabama and Mississippi which lie south of the thirty-first parallel, and by that portion


UNITED STATES
SHOWING
ACCESSIONS OF TERRITORY.
0 100 200 300 400 500 600
Scale. 550 miles to 1 inch.
110° Longitude West 100° from Greenwich 90°
CANADA
PACIFIC OCEAN
ATLANTIC OCEAN
OREGON
Columbia R.
Acquired by Discovery 1792.
Exploration 1805.
Astoria Settlement 1811.
Florida Treaty 1819.
British Claims extinguished 1846
MEXICAN TERRITORY
CEDED 1848
LOUISIANA
Purchased from France
1803
Ceded by Texas to United States 1850
TEXAS
Annexed 1845
GADSDEN PURCHASE
1853
Rio Grande
MEXICO
Mississippi R.
THE UNITED STATES
1783
ORIGINAL THIRTEEN STATES
NEW YORK
N.H.
MASS.
CONN.
PENN
N.J.
MD.
DEL
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
FLORIDA
Purchased from Spain
1819
In dispute with Spain
1803 to 1819
NEWFOUNDLAND
BERMUDA
Gulf of Mexico
BAHAMA ISLANDS
CUBA
JAMAICA
HAITI
SANTO DOMINGO
PORTO RICO
Ceded by Spain
1898
Caribbean Sea
M.-N. WORKS.
PHILIPPINE ISLANDS
Same Scale as Main Map.
Manila
Ceded by Spain
1898.
Sulu Sea
(Jolo Sea)
Celebes Sea
BORNEO
120° Longitude East from Greenwich
Longitude East 160° from Greenwich
HAWAII
Same Scale as Main Map
Annexed 1898
Honolulu
GUAM
Ceded by Spain 1898
SAMOA
Same Scale as Main Map
Tutuila
Apia
(German)
By Treaty,
1872 and 1900
Arctic Ocean
SIBERIA
Bering Strait
Bering Sea
CANADA
Yukon R.
ALASKA
Purchased from Russia
1867
Gulf of Alaska
ALASKA
Same Scale as Main Map.
Longitude West 150° from Greenwich

of Louisiana which lies east of the Mississippi and is not included in the "Island of New Orleans." This territory was styled by Spain the "provinces of East and West Florida." Previous to this cession, by the authority of the joint resolution of Jan. 15, 1811, and the Acts of Jan. 15, 1811, and March 3, 1811, passed in secret session and first published in 1818, the United States had taken possession of the East and West Floridas. In fact, as early as 1810 the Americans controlled all of West Florida except Mobile, which was annexed in 1813, while in 1814 Jackson temporarily seized Pensacola, and again in 1818 occupied both Pensacola and St. Marks. The United States, however, did not take formal possession until 1821. After prolonged negotiations and a vigorous political contest Texas, formerly a portion of Mexico, and later an independent republic, was admitted to the Union by a joint resolution of Congress, approved by President Tyler on March 1, 1845. As a result of the Mexican War (q.v.), by the Treaty of Guadalupe Hidalgo (q.v.), on Feb. 2, 1848, Mexico ceded the territory now covered by California and Nevada, also her claims to the territory covered by the present Texas, by Utah, by the bulk of Arizona and of New Mexico, and by portions of Wyoming and Colorado. That part of Arizona and that part of New Mexico lying south of the Gila and known as the Gadsden Purchase were ceded by Mexico on Dec. 30, 1853. By treaty of March 30, 1867, Russia ceded Alaska. At the close of the Revolutionary War the territory really occupied by the old 13 States covered scarcely a quarter of a million square miles, and after the treaty of 1783 the nation occupied only 825,000 square miles, but in 1867 the territory belonging to the United States had an area in round numbers of 3,561,000 square miles. A further accession was effected in 1898, when, on July 6, Congress passed a joint resolution annexing Hawaii (q.v.) to the United States. In the following year negotiations were concluded by which the island of Tutuila, Samoa, on which is located the excellent harbor of Pagopago, was ceded absolutely to the United States. An important accession of territory was that incident to the Spanish-American War (q.v.), and formally effected in the treaty of Dec. 10, 1898, in accordance with which Spain ceded Porto Rico (q.v.) and the Philippine Islands (q.v.), together with the island of Guam (q.v.), to the United States.

Bibliography. The most important volume in this connection, with all the texts, is the *Treaties and Conventions Concluded by the United States and other Powers since July 4, 1776*, published by the Government (Washington, 1889 et seq.). Some useful maps illustrating these treaties are to be found in Edward Channing, *The United States of America, 1765–1865* (New York, 1896); id., *History of the United States*, vols. i, ii (ib., 1905–08). Consult also Theodore Roosevelt, *Winning of the West*, vol. iv (New York, 1904); C. K. Adams, *History of the United States* (rev. ed., Chicago, 1909). Of special works, Donaldson, *Public Domain* (Washington, 1884); H. B. Adams, *Maryland's Influence on the Land Cessions* (Baltimore, 1885); O. P. Austin, *Steps in the Expansion of our Territory* (New York, 1903); Henry Gannett, *Boundaries of the United States* (3d ed., Washington, 1904); Justin Winsor, *Narrative and Critical History of America*, vol. vii, Appendix (Boston, 1886–89).

UNITED STATES, Literature of the. See American Literature.

UNITED STATES CHRISTIAN COMMISSION. An organization kindred to the United States Sanitary Commission (see Sanitary Commission, United States), formed during the Civil War in the United States to promote the spiritual and physical welfare of Federal soldiers and sailors. A convention of Young Men's Christian Association delegates met in New York City in November, 1861, and formally organized the United States Christian Commission of 12 members with George H. Stuart, a Philadelphia philanthropist, as president, and B. F. Manierre, of New York, as secretary. Contributions of money, literature, and supplies were asked for and a generous response was made. The central office of the commission was in Philadelphia, but it had branches in all of the large towns and cities, and its agents followed the armies. Temporary libraries were established; chapels for religious worship were erected at permanent camps; Christian burial was accorded to the dead; graves were suitably marked. The American Bible and Tract societies gave enormous quantities of their publications for distribution; the government furnished free transportation to the commission's agents and for its supplies, while the telegraph and transportation companies furthered its efforts in various ways. Consult Moss, *Annals of the United States Christian Commission* (Philadelphia, 1868).

UNITED STATES COPYRIGHT ACT. By the Act of March 4, 1909, the law with reference to copyright was redrafted and rearranged. The second or renewed period of copyright was extended to 28 years, thus increasing the life of the copyright by an additional 14 years. The duties which had been assigned to the librarian of Congress were delegated to a newly created officer called the register of copyrights.

In pursuance of authority contained in the statute itself the United States Supreme Court formulated a set of rules which simplified the procedure and practice with reference to copyright actions and proceedings. The prohibition against the importation of works which are copyrighted in the United States was modified by the Act so as to permit the importation of works in raised characters for the use of the blind, and authorized editions in the original foreign language of works whose translations only have been protected by United States copyright. Exception was also made of libraries or collections purchased abroad *en bloc* for societies, institutions, or libraries of learning and fine arts. The provisions dealing with infringements were considerably amplified and set forth at some length in the statute.

Later amendments to the Act include motion-picture photo plays and motion pictures other than photo plays as works on which copyright may be claimed. Provision was also made for phonograph records and royalties to owners or manufacturers of this class of articles.

The additions to the United States Copyright Act with reference to photo plays and phonograph records were incorporated into the British Act by the Act of 1911, which amended and consolidated the English copyright law along lines similar to the American.

UNITED STATES DAUGHTERS OF 1812. A patriotic society founded in Cleveland, Ohio, in 1892, and incorporated as a national organization Feb. 25, 1901. It has for its object the perpetuation of the memory of the founders of America, with their records of service in the French War, the Revolution, and the War of 1812. It admits to membership women who are lineal descendants from an ancestor who assisted in the War of 1812, either as a military or naval officer, a soldier, or a sailor, or in any way gave aid to the cause. The membership is about 1000.

UNITED STATES FLAG. See Flag.

UNITED STATES MILITARY ACADEMY. See Military Academy, United States.

UNITED STATES NATIONAL MUSEUM. Established as a branch of the Smithsonian Institution, by the congressional Act of Aug. 10, 1846, founding the latter. It is the designated depository for all collections in zoölogy, botany, geology, ethnology, archæology, and the arts belonging to the government. Its collections are superior in all that relates to the natural history and aborigines of North America. Its collections have been derived largely from naval expeditions, government surveys, Bureau of Fisheries, Department of Agriculture, Bureau of American Ethnology, private donations, and exchanges. The Museum also gathered interesting collections in American history. The fundamental act contemplated the formation of a National Gallery of the Fine Arts under the Smithsonian Institution. The first decisive movement towards the realization of this project took place in 1906, through the gift by Charles L. Freer of paintings by Whistler, Tryon, Thayer, and Dewey, and of Oriental art, and the bequest of the Harriet Lane Johnston collection. In March, 1907, 50 paintings by American artists were added by William T. Evans. A supplemental transfer of 110 articles increased the Freer collection to 4811 items of American and Oriental art in 1915. From time to time other accessions have been made through purchase or gift. The collections occupy the greater part of the Smithsonian building, an adjacent building, covering 2¼ acres, completed in 1881, and a new building completed in 1910 at a cost of $3,500,000. In 1914–15 nearly 6000 specimens of American industrial arts were added. The Secretary of the Smithsonian Institution is ex officio the keeper of the Museum, which is under the charge of an assistant secretary, and has a staff of curators and assistants, numbering about 75. The publications comprise an annual report, a series of *Bulletins* begun in 1875, a series of *Proceedings* dating from 1878, and the *Contributions* from the National Herbarium. The library contained (1915) 45,818 volumes and 76,295 pamphlets.

UNITED STATES NAVAL ACADEMY. See Naval Academy, United States.

UNITED STATES VETERAN NAVY. A patriotic society organized Sept. 21, 1899. Eligible for membership are all persons who as commissioned officers or enlisted men were connected with any branch of the naval service of the United States during the Civil War or the Spanish-American War, or who in the future shall be engaged, as members of the navy, in war against an enemy of the United States. The society has a total membership of about 3500.

UNITED ZION'S CHILDREN. See River Brethren.

UNITIES, Dramatic. Three classical qualities of a drama, the unities of time, place, and action. See Drama.

UNIT ORCHESTRA. See Unit Organ.

UNIT ORGAN. A wind instrument, the most recent development of the regular church organ (q.v.). In 1853 William Hill and Sons introduced a new stop, the voix céleste, the pipes of which were tuned slightly flat so as to produce, in combination with other stops, an undulating tone resembling that of the strings of an orchestra. By experiment it was found that by tuning the pipes a trifle sharp a warmer tone was produced. By the end of the century the céleste was built with three ranks of pipes, one in correct pitch, the other two slightly sharp and flat, respectively. Thus a tone was produced that very nearly approached the strings. The next step was the addition of the new percussion stops, which operate real chimes, cymbals, and all kinds of drums. Organs thus equipped became known as unit organs, and about 1908 began to be installed in some theatres, replacing the orchestra. Two or three years later appeared the unit orchestra. Several builders, almost simultaneously, conceived the idea of replacing in these instruments the diapason (see Organ), which always has been, and still is, the foundation of the real organ tone by the céleste or string tone. Thus it can readily be seen that a unit organ is essentially an organ with a moderate admixture of céleste and percussion stops, whereas the unit orchestra has a full complement of célestes and percussion stops, to which the diapason is very much subordinated.

UNIT SYSTEM. The unit system of organization, sometimes called the Hine system from its originator, Maj. Charles DeLano Hine, is based upon the concept that organization is a branch of sociological science. The system seeks, primarily by scientific organization and secondarily by simple, direct methods, to solve the administrative problems imposed by complex modern conditions in the conduct of government, of education, of industry, of transportation, and of commerce. As yet its application has been confined to a few railways. The system insists that organization is a series of units, beginning with the individual as the indivisible unit of society. A group of individuals forms a unit of organization. A group of such units constitutes a higher unit, which in turn may become a component of a still higher unit, and so on to whatever extent may be found desirable and practicable in the particular activity. The crux of a given problem of organization is then to determine what grouping produces the most logical and efficient units. The system demands unvarying recognition of the axiom that the whole is greater than any of its parts, that the entire undertaking is greater than any of its constituent administrative departments. The avowed effort in practical application is to emphasize and encourage such an old fashioned sense of individual and personal responsibility as will produce maximum composite efficiency through balanced team work of the component units. A general notion of the system is best conveyed by an outline of the official instructions through which it is inaugurated.

In the general operating organization of a railway, the commonly used titles general superintendent, superintendent of motive power, chief engineer, superintendent of transportation, general storekeeper, superintendent of telegraph, and perhaps superintendent of dining cars, are abolished. The officials previously thus designated, while they continue charged with the responsibilities formerly devolving upon them, are reappointed assistant general managers of the road. Similarly the divisional officers, known under the older systems as master mechanic, division engineer, train master, traveling engineer, and chief dispatcher, and possibly division storekeeper, and station inspector, exchange these titles for the general title of assistant superintendent. The number of assistant general managers may vary with the size of jurisdiction, but is normally eight, including the man previously the assistant general manager, who, to avoid misunderstanding, is reappointed as senior or number one, on the new official list. The number of assistant superintendents on an operating division naturally varies with its size, but is normally six (perhaps eight, if storekeeper and station inspector be included), the man previously known as the assistant superintendent standing number one on the new list. In either general or divisional offices this senior assistant is normally at headquarters, and is in effect, though not in name, the chief of staff, though no distinct grade of senior or chief assistant is actually created. In case of the prolonged absence of this number one (or actual, although not nominal, senior) the head of the unit (general manager or superintendent, as the case may be) designates the most available of the other assistants to remain at headquarters. An unwritten law operates to make such designated assistant the chief, or senior, of all others for the time being. Advantage is sometimes taken of this elastic feature of assignment to rotate various assistants through the senior chair in order to gain comprehensive training for higher positions.

While each man remains specially charged with his former duties, he gains through his broader title a new vision of responsibility for efficiency of the road as a whole. The hurdles of departmental prejudice are removed, the limitations of descriptive title are abolished, and broader lines of activity and of interest in the conduct of the property as a whole are developed. It is to be noted further, that the unit system of organization eliminates government by chief clerks. If the manager or superintendent is absent from headquarters there is always an assistant manager or an assistant superintendent in charge. The system insists further that no person shall sign the name or initials of another. All officers, agents, and employees are instructed to transact business within their respective spheres of responsibility or authority, over their own initials. Operators, stenographers, clerks, and others are instructed to avoid autographic imitation, a man's name being considered his birthright. When an individual's own title is normally insufficient for the necessary signature, or when the prefix acting or assistant is inappropriate, he must sign for himself, adding such explanatory phrase as for the agent, etc. The unit system thus aims, while retaining each official for the work for which he is specially qualified, to make every one available for prompt, comprehensive action when occasion requires, and to minimize the undesirable features of necessarily distant control by insisting that such inside direction shall be exercised only by officials duly qualified by outside experience.

UNITY OF CONSCIOUSNESS. In epistemology, the formal a priori of all cognition; the subjective source of categories, forms of intuition, and the assumption (*Setzung*) of objects. It is, therefore, practically the equivalent of Kant's transcendental apperception. The unity of consciousness derives from the broader unity of the self, i.e., the identity, permanency, and unity of a conscious living being. We may, then, think of the unity of consciousness as the equivalent of the self as conscious; and in various epistemological systems the terms self, unity, and unity of consciousness are employed interchangeably. The phrase is also used in functional psychology to denote the coherence of mind; the functions of thinking, feeling, willing, are conceived as part-functions belonging to an underlying unity, which is again frequently identified with the self (q.v.). Consult: J. M. Baldwin, *Senses and Intellect* (New York, 1890); Harald Höffding, *Outlines of Psychology* (ib., 1891); M. Eisler, *Wörterbuch der philosophischen Begriffe* (Berlin, 1910).

U'NIVER'SALISM (from *universal*, from Lat. *universalis*, relating to all or the whole, from *universus*, all, whole, entire, turned into one, from *unus*, one + *vertere*, to turn). The name given to the religious faith of those who believe in universal salvation, or as it is now generally stated, in the eternal progress of all souls. Modern Universalists claim that this doctrine is contained in the New Testament, in the teachings of Jesus, and is in harmony with the laws of nature as taught by science and sanctioned by reason and philosophy. Universalists claim this interpretation of the Bible dates from the early centuries of Christianity, citing in proof thereof the Sibylline Oracles (c.150), and the teaching of Clement of Alexandria (c.195), that man was created to be educated and not for a limited trial, that his opportunity for education is as lasting as his being, and that punishment is remedial. They find it in the teachings of Origen (c.185–c.254), and in the common belief among Christians of all sects in the second and third centuries that between the death and the resurrection of Jesus he went to the underworld and there taught the souls that had sinned in the days of Noah; these, argued Clement, included all who there or elsewhere need salvation. Universalists also believe that their faith was extensively held in the fourth century and that of the six theological schools then established in the Christian world, four (the schools of Alexandria, Cæsarea, Antioch, and eastern Syria) taught it; that it was also fundamental in the fifth century in the teachings of Theodore of Mopsuestia, the founder of the Nestorian Church, in whose *Confession of Faith* and *Sacramental Liturgy* it is plainly declared; that Maximus the Confessor (580–663) also taught and defended it in the sixth and seventh centuries; that Pope Gregory's instructions to his missionaries show its existence in the eighth century, and that in the ninth it was ably advocated by John Scotus Erigena. The subsequent period until the Lutheran Reformation was not favorable to any expression of thought that antagonized the Latin theology. The Church silenced by force all voices that repudiated its teachings and burned all books contaminated by so-called heresies. But, in spite of all this, Universalism was manifest in the teachings of such thinkers as Raynold, Almaric, Albertus Magnus, Solomon, Bishop of Bosra, Ruysbroek, Tauler, and John of Goch, and in the societies of the Lollards, Brethren of the Common Life, Brethren and Sisters of the

Free Spirit, and the Men of Understanding. With the Reformation Universalism revived. The original 42 articles of religion, drawn up by the Reformers in England in 1552, declare: "They also deserve to be condemned who endeavor to restore that pernicious opinion that all men (though never so ungodly) shall at last be saved; when for a certain time, appointed by the Divine Justice, they have endured punishment for their sins committed." When the articles were reduced to 39 in 1571 this condemnatory article was omitted. Many of the Mystics, the German Baptists, the Mennonites in Holland, the French Protestants, the Moravians, and various smaller sects in the Old World, advocated Universalism.

It was not, however, until about 1750 that an organization called Universalist was created. Before that time the believers in universal salvation were affiliated with sects bearing various names and were spoken of as Origenists, Merciful Doctors, and by other names indicating their dissent from the dogma of the never-ending misery of the wicked; but at the date first given Rev. James Relly became a Universalist and organized a Universalist church in London, to which he ministered until his death, about 30 years later. At the present time very few churches in Europe bear the Universalist name, but the doctrine of Universalism finds favor, and in some instances open advocacy, in churches of various names. Many Unitarians in Europe are avowed Universalists, just as the Universalists of America are generally Unitarians.

The doctrine of Universalism was preached in America as early as 1636 by Samuel Gorton, the New England mystic, and put forth in the speeches and writings of Sir Henry Vane, the younger, Governor of Massachusetts; by Dr. George de Benneville about a century later; by eminent Episcopalians; by prominent Congregationalists, such as Chauncey and Mayhew of Boston, and Huntington of Connecticut; and by many German Baptists. John Murray (q.v.), the father of Universalism in America, came to New Jersey in September, 1770. On Jan. 1, 1779, 15 persons who had been suspended from the First Parish Church in Gloucester, Mass., for becoming regular attendants on the preaching of Murray, united under "Articles of Association as the Independent Christian Church in Gloucester" for the defense and promulgation of their Universalist faith. Murray was not long without ministerial helpers. Elhanan Winchester, who had been an eminent Baptist preacher in Philadelphia, with more than 100 of his church in that city, was excommunicated for having become believers in Universalism; Adams Streeter and Caleb Rich, in New England, became preachers of the common salvation before they saw or knew Murray. Later, Hosea Ballou, repudiating all the old notions connected with trinitarian dogmas, became the first openly avowed American advocate of Unitarian views of Christ; put the emphasis of Christian theology on God's Fatherhood of the human race; and interpreted the teachings, sufferings, death, and resurrection of Jesus as designed, not to effect any change whatever in God, but to change man and bring him into harmony with his Heavenly Father. The modern church has a free platform and a broadly educated ministry. It recognizes a harmony and not a conflict between religion and science; advocates the principles of evolution; interprets the Bible rationally and spiritually and not literally; teaches that all men are divine by nature, are capable of development after the Christ type, and man's destiny is the full development of his soul and a harmonious cooperation with God's laws.

In 1803, at the annual session of the New England Convention, in view of diversity of opinion as to how universal salvation was to be the result of God's government, three Articles of Belief were agreed upon as stating the general belief of those present and serving as a working basis of fellowship. The articles of fellowship, known as the Winchester (N. H.) Profession of Faith, are as follows:

Article 1. We believe that the Holy Scriptures of the Old and New Testaments contain a revelation of the character of God and of the duty, interest, and final destination of mankind. Article 2. We believe that there is one God, whose nature is Love, revealed in one Lord Jesus Christ, by one Holy Spirit of Grace, who will finally restore the whole family of mankind to holiness and happiness. Article 3. We believe that holiness and true happiness are inseparably connected, and that believers ought to be careful to maintain order and practice good works; for these things are good and profitable unto men.

In 1870, when the Universalists of the United States formed their General Convention, the above three articles were made a basis of their clerical fellowship, but as there soon arose different opinions as to the exact meaning of particular phrases in the three articles, several changes were advocated from year to year, until 1898, when, at a convention in Chicago, it was voted to allow the three articles to stand as the historical basis, but to add the following as explanatory of the conditions of fellowship in the future:

The conditions of fellowship shall be as follows: (1) The acceptance of the essential principles of the Universalist faith, to wit: (*a*) the universal fatherhood of God; (*b*) the Spiritual authority and leadership of His Son, Jesus Christ; (*c*) the trustworthiness of the Bible as containing a revelation from God; (*d*) the certainty of just retribution for sin; (*e*) the final harmony of all souls with God. The Winchester Profession is commended as containing these principles, but neither this nor any other precise form of words is required as a condition of fellowship, provided always that the principles above stated be professed. (2) The acknowledgment of the authority of the General Convention and assent to its laws.

In 1870, in the organizing of the Universalist churches of America, the church adopted the plan under which the United States have organized. This General Convention has supervision over the work of the denomination, meets once in two years, has a board of 11 trustees to carry on the work between convention sessions. The women of the church also have a national organization known as the Woman's National Missionary Association, which holds funds and carries on missionary work, chiefly in the South and West, and supports the Blackmer Home for Girls in Japan. In 1889 the young people of the church formed a national organization, the Young People's Christian Union. Funds raised by this support churches in the West and South. It publishes a weekly paper at Boston, the *Onward*. Under the administration of the General Convention are several commissions, such as the

Sunday School Commission, the Social Service Commission, the Commission on the Ministry, and the Educational Commission. All have their own officers and initiate work in their several lines. In Boston is the Universalist Publishing House, which publishes weekly the *Universalist Leader*, the *Sunday School Helper*, and the general literature of the denomination. Local Universalist papers are published in several States and by individual churches. The missionary work of the church is supported by the income of funds and quotas assessed on parishes. The most important foreign mission is in Japan. It was started in 1890 and now has schools and churches and many American and native preachers and teachers. There are now three colleges and four academies under the auspices of the denomination, having funds (1915) $5,860,000, professors 383, students 3100. The theological schools maintained are (1) the Canton Theological School, opened at Canton, St. Lawrence Co., N. Y., in 1858. Although affiliated with St. Lawrence University, the theological school is a separate institution in its management and property, (2) Crane Theological School, affiliated with Tufts College, Medford, Mass. This was established in 1868 as Tufts Theological School, but was changed to the name of Crane Theological School in 1898, in honor of an endowment from Albert Crane of Stamford, Conn. (3) In 1881 a theological department was opened in Lombard College, Galesburg, Ill., and in 1890 its name was changed to the Ryder Divinity School, in honor of the late Rev. William Henry Ryder, D.D. In 1908 the school was removed to Chicago, where it became a part of the University of Chicago, though still retaining its name.

The church statistics for 1916 show 763 church organizations, 628 ministers, 55,000 church members, 250,000 parish members, 43,211 Sunday-school members, 11,306 members of the Young People's Christian Union, and $19,377,640 church property.

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UNIVERSAL JOINT, IN MOTOR VEHICLE. See MOTOR VEHICLE.

UNIVERSAL LANGUAGE. Need for a means of international communication has been felt from the earliest times. It is obviously impossible for one to acquire more than a few languages at most, and they are used correctly only by those gifted with exceptional linguistic ability. As a response to a desire of this nature it is quite possible that the so-called *Lingua franca* (q.v.) arose. In early times Phœnician (see PHŒNICIAN LANGUAGE) served as a means of intercommunication among the traders of the Mediterranean, while in the Middle Ages Latin was the common learned language of Europe. But with the growth of the spirit of nationality in the period of the Renaissance, as well as because of the realization of its unsuitableness for the expression of modern thought, Latin was gradually discarded in favor of the vulgar tongue. It was soon found that extensive increase of commerce and the development of scholarship rendered the need of an international language more imperative, and in the seventeenth and eighteenth centuries various language systems were proposed, while in the nineteenth century their number is so great that it is not possible to enumerate them here. (See INTERNATIONAL LANGUAGE.) Though French as the language of diplomats has been offered by some as a substitute for a universal language, scholars were quick to realize that the selection of a living tongue would arouse unnecessary international jealousy. Likewise it is a truism that all languages present difficulties of a more or less serious nature to the learner. The Chinese language (q.v.), e.g., though apparently simple in structure, would require years of study for the average European, while English and French can be seriously objected to because of their unphonetic spelling. On the other hand the most successful language systems proposed, such as Volapük, Esperanto (qq.v.), Bolak, and Idiom Neutral, are met with the fundamental objection that they are based on modern European tongues and are unfit as universal languages because they do not contain the characteristic elements of any of the important groups of languages spoken on other continents. Yet it may be advanced in their favor that it is absolutely impossible to create a language that would be equally easy to be acquired by speakers of all known dialects, and that they certainly demand less effort on the part of the learner than any modern spoken language.

UNIVERSALS. Characteristics or attributes of objects when regarded as common to an indefinite number of individuals. There have been philosophers who denied the real existence of universals (see NOMINALISM), and others who asserted that universals exist apart from and prior to the objects they qualify. The problem of the nature of the universal is one of the most difficult and most mooted questions of philosophy. See LOGIC; REALISM.

UNIVERSITY (Lat. *universitas*). A term which, as originally used, denoted any corporate body, community, or association regarded as a whole. In its modern sense, that of a corporate body devoted to study, teaching, and investigation, the term came into use in the fourteenth and fifteenth centuries. The institutions first so designated in this modern sense of the term came into existence some two centuries before the common use of the term, and others somewhat similar had existed in ancient times under Greco-Roman influence. There was at Athens, at the time of the Roman Empire, a university not only in all the essentials of a great centre of learning, but one that closely corresponded even to what we now mean by that word. Schools of philosophy and letters similar to those at Athens sprang up at other great cities of the Roman Empire—at Constantinople, at Alexandria, at Rhodes, at Marseilles, at Apollonia (Illyria), and at Rome itself. These, however, had little or no influence on mediæval institutions.

Mediæval Universities. The university, in a modern sense, originated during the twelfth and thirteenth centuries, as an outgrowth of schools existing prior to that time in connection with cathedrals and monasteries. Throughout the eleventh and twelfth centuries there had grown up a new interest in dialectic, logic, and philosophy through the many theological controversies aroused by the earlier schoolmen and the heresies of the times; in Roman law through the controversies between the Holy Roman Empire and the Italian municipalities and the growing importance of canon law in Church administration; and in medicine on account of the Crusades and the contact with the East and with Saracen learning. When a teacher of eminence appeared, such as Abélard or Peter Lombard at Paris, or Irnerius at Bologna, a large number of students were attracted. This student body is said to have numbered 30,000 at Paris at the time of Abélard. Such a place of learning and concourse of students was called a *studium*, or later a *studium generale* to distinguish it from the more selected *clientèle* and function of the monastic or cathedral school. The addition of the subject matter of philosophy to the previous religious discussions, the new methods of treatment, and the greater freedom of thought were responsible for the building up of the first universities of northern Europe, and the most influential of all mediæval universities, that of Paris. The students were no longer necessarily destined for monastic or clerical life, though many were. At least the discipline was much less strict, and the students would not adapt themselves to the rigid rules of monastery or cathedral. They were no longer drawn from a restricted area, but were admitted from any region, and numbers flocked to schools in foreign lands. Civil and canon law, medicine, and theology were now added to the seven liberal arts.

The determining characteristic of the universities, however, was their specialization; each of the earlier universities was especially strong in some one line. At Salerno, in southern Italy, early in the eleventh century, the monks had given special instruction in medicine, and the fame of this new seat of learning spread with the First Crusade. During the twelfth century great attention was paid to the study of Roman law, especially in northern Italy, where the instruction centred in Bologna—notably so during the life of the great teacher Irnerius. In Paris theology was the subject of interest, though the majority of pupils there were students of the liberal arts, not yet qualified for the study of theology. These groups of students and teachers, drawn together from distant regions, were controlled by no monastic rules, amenable to no political authorities, and practically without protection in their rights and privileges if any then existed. Organization was necessary, and the natural tendency was to organize on the basis of nationality. The nations were the first organizations, and they, through their delegated officers, made the central organization of the body as a whole. Even before organization, as well as afterward, such a body of students was termed a *studium generale*. To the organization the term *universitas* (corporation) was given, but never by itself alone. The terms most frequently used were *universitas magistrorum*, or *universitas magistrorum et scholarium*, or *universitatis collegium*. In the course of time the various nations and faculties, each at first a *universitas*, were united into one, the distinctions between the terms *studium generale* and *universitas* were lost sight of, and the latter term was used alone to indicate the general body instead of the constituent parts.

One great difference existed between the universities of southern and those of northern Europe. In the former, modeled after Bologna, the students constituted the corporation; in the latter, modeled after Paris, the teachers controlled, if they did not always completely constitute, the corporation. The reason for this distinction was that the students of the southern universities, especially of Bologna, were mature students of law, capable of self-government, both on account of their age and the subject of study; while in the North they were the more youthful students of arts, many entering Paris at the age of 12 or 13.

The privileges which built up the universities were either local, bestowed to prevent removal elsewhere, or general, constituting them integral parts of church and state. The state exempted members of universities from financial and military services, save under exceptional circumstances; the church bestowed the privilege of clergy and the right to teach. When the student had demonstrated his ability to determine and to define the terms in the prescribed trivial (see Trivium) texts, he received the bachelor's degree. When he had demonstrated his ability to conduct a disputation, i.e., an exposition of the more advanced texts, through a public defense of a thesis, the master's or doctor's degree was conferred. This entitled the recipient to teach within the limits of the university. Towards the end of the thirteenth century Pope Nicholas III granted to the University of Paris the right of endowing its graduates with permission to teach everywhere, a privilege later conferred upon most universities. The degrees themselves were similar to and probably borrowed from the corresponding stages in the learning of a craft or in the organization of chivalry. The earlier stage was an apprenticeship, the close of which was marked by the conferring of the bachelor's degree; the following was a journeyman's period, during which the candidate pursued his studies, and at the same time practiced his art by teaching the younger students the trivial studies. The master or doctor had the right to teach at least in his own and usually in any university; during the earlier period he was under obligations to teach in his own. In time it became customary to endow a select number of the graduates as permanent public teachers; these privileged and salaried graduates were designated professors, and instruction by professors more or less supplanted the original plan of teaching by graduates. The privatdocent of the German universities now represents the modification of the old regent graduates.

The term "faculty" was originally used in the most general sense of science or knowledge; later to indicate a department of study, as the faculty of arts. Then a more special connotation became not unusual, as synonymous with the *consortium magistrorum*, or council of masters. By ordinary usage, however, the term was applied to the subordinate corporation of masters, or of masters and students in particular departments of learning. The University of Paris had at first only a faculty of arts, which existed in an organized form as early as 1169. In the thirteenth century faculties of theology, medicine, and canon law were added. These, with the faculty of civil law, constituted the organization of the typical mediæval university, though not all universities had all faculties represented even at the Renaissance period. The primary units of organization of the universities were the nations, though by the fourteenth and fifteenth centuries these were succeeded in importance by the faculties. In Paris the Faculty of Arts was divided into four nations, known as French, Picard, Norman, and German or English. After the thirteenth century these four nations, under their respective procurators, and the three faculties subsequently added, under their deans, constituted the seven component parts of the university. The procurators and deans elected the rector of the university, its highest officer, who possessed executive authority of a delegated nature. The rector with the procurators and the deans formed a court having cognizance of all matters relating to discipline, from which there was an appeal to the university and thence to the Parlement of Paris. The chancellor, after the rector, was the highest in authority, though that authority was confined to the conferring of degrees. Originally the chancellor was the immediate representative of the archbishop, to whom had previously belonged the right of conferring the privilege of teaching. Details of organization, as well as designations of the officers, varied considerably in the early universities, though in general they were all modeled on Paris or Bologna. In the latter city the *universitates* were to be distinguished from the *collegia*. The former were two in number, the *ultramontani* and the *citramontani*, which were composed exclusively of the students of law organized into constituent nations, thirteen in one case and fourteen in the other, each presided over by its procurator and counselors. The *collegia* were organizations of professors and doctors that had control of the conferring of degrees. These colleges were of the doctors of civil law, doctors of canon law, doctors of medicine, and, from the middle of the fourteenth century, doctors of theology. The general control of the *studium generale*, however, was in the hands of the universities later combined into one.

The colleges, as they developed in other countries, were quite different institutions from those of Bologna. They arose through provisions that were made for poor students in connection with hospitals or monastic foundations. The necessity for some more domestic supervision of young students, combined with the other tendency, led to the foundation of Halls. These in turn were endowed with corporate privileges as well as property, and the term "college," previously a general term as *universitas* itself had been, was appropriated by these institutions. They soon assumed the character of boarding houses for all classes of students, where they were privately trained and prepared for public lectures. In some universities the lectures came to be given in the college, first the extraordinary, then the ordinary, until the general university lectures almost disappeared, and no student was admitted except as a member of a college. Many of these colleges were identified with particular faculties, or even departments of faculties. Probably the earliest college of all, which served as a type for the others, was the college of the Sorbonne (q.v.), founded about 1250 in the University of Paris, which came to be identified with the theological faculty.

Details concerning the early history of the universities, their development, and their present organization will be found in the articles on the individual universities. The early organization of universities has been best adapted to the needs of the present by the German universities, and is more specifically treated in that section.

England. These universities are of two distinct types: those that date from the Middle Ages, Oxford and Cambridge, and those founded during the nineteenth century. The two former have had a profound influence upon national development and national life, for in no other country have universities been more intimately connected with the religious, political, and literary development. The details of the history and present organization of these two universities, with the literature of the subject, will be found under the titles OXFORD UNIVERSITY and CAMBRIDGE, UNIVERSITY OF. During the nineteenth century four universities of the modern type were founded, all laying stress on the study of the sciences and the technical branches. These are Durham University (1832), University of London (1836), Victoria University (1880), and Birmingham University (1900). Birmingham University was organized on plans similar to those of London and Victoria universities, with Mason College as a nucleus. The university is governed by a chancellor, principal, and a court of governors consisting of the faculties or certain members thereof. Four faculties have been established, arts, science, medicine, and commerce, but degrees are also to be given in science and engineering. The aim in its establishment is to bring university work into more direct relations with industry and commerce. The university began work in 1902 with the Rt. Hon. Joseph Chamberlain as chancellor. The example set by Birmingham was soon followed by other large commercial centres, though there is a little variation in the organization of faculties, schools, or departments. In 1903 Liverpool University was developed from Liverpool University College, of Victoria University. Victoria University now limited its authority and activities to Manchester. The University of Leeds followed, and in 1905 the University of Sheffield was added as the sixth of the modern universities of England. To this number must be added the University of Bristol, the University of Wales, with its constituent colleges, and a number of university colleges affiliated with the universities of Oxford, Cambridge, or London, e.g., Exeter, Reading, Southampton, and Nottingham.

Scotland. Scottish universities were mostly founded during the fifteenth century. The mediæval character clung to them until 1858, when by statute the universities were reorganized. See Saint Andrews; Aberdeen; Glasgow; Edinburgh, University of.

Ireland. Irish universities are those of Dublin, the National University of Ireland with its constituent colleges in Dublin, Cork, and Galway, and the University of Belfast. See Dublin, University of, and National University of Ireland.

Canada. Canadian universities have increased rapidly in numbers with the development of the western provinces. There were, in 1916, 19 degree-granting institutions, and some 12 other colleges, usually denominational in character, which are affiliated to those granting degrees. The leading universities are Toronto, McGill, Queen's at Kingston, Laval in Quebec, Acadia and Dalhousie in Nova Scotia, and the provincial universities of Alberta, British Columbia, Manitoba, and Saskatchewan. See under Canada.

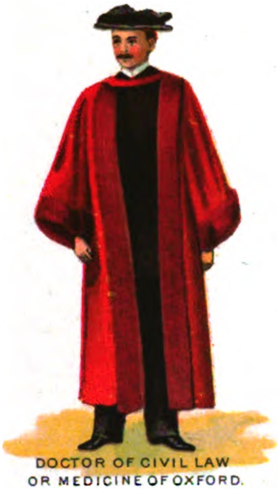
Australia. Universities exist at Sydney, Melbourne, Adelaide, Brisbane, Perth, and at Hobart in Tasmania. The first was founded in 1852 and is affiliated with the University of London and with a women's college (1894). There are four faculties—arts, law, medicine, and science, and chairs of military science, dentistry, agriculture, and engineering. In 1914 the student body numbered 1227. The University of Melbourne was established and endowed by an act of the Victorian Parliament in 1855. There are three affiliated colleges in connection with the Church of England, the Presbyterian and the Wesleyan churches. The student attendance in 1913 was 1244. The University of Adelaide was incorporated in 1874 and was the first in Australia to grant degrees to women (1880). Faculties are organized in arts, sciences, medicine, law, and music. The number of matriculated students in 1913 was 459. The University of Queensland, which was established in Brisbane in 1910, has faculties of arts, science, law, medicine, and engineering. The number of students in 1914 was 151. The University of Western Australia at Perth was opened in 1913 and has faculties of arts, science, and engineering, attended in 1913–14 by 186 students. The University of Tasmania was founded at Hobart in 1890. It consists of three faculties—letters, science, and law—and in 1913–14 had 107 students.

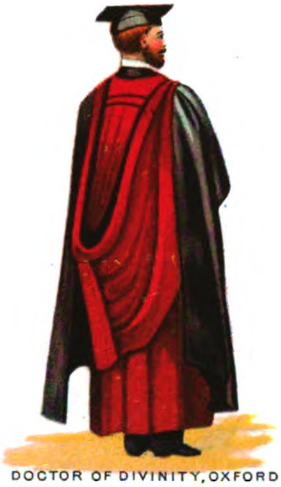
The University of New Zealand was founded in 1871 and later empowered to confer degrees in the arts, science, law, medicine, dentistry, architecture, engineering, commerce, agriculture, veterinary science, and music. In 1874, by union with the University of Otago (founded in 1869), the functions of the former institution are restricted to its giving examination and conferring degrees, while the latter became an affiliated college. A college of mines was later established. The attendance in the constituent colleges at Dunedin, Christchurch, Auckland, and Wellington was more than 1500 in 1914.

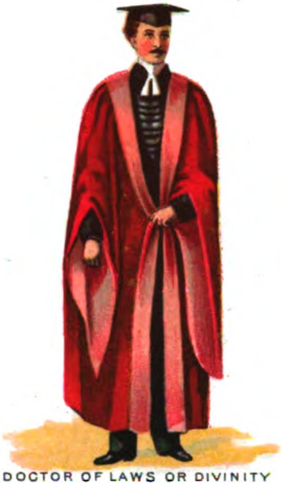
India. The universities of India, with the dates of their establishment, are as follows: Calcutta, 1857; Bombay, 1857; Madras, 1857; Punjab, 1882; and Allahabad, for the Northwest Provinces (United Provinces of Agra and Oudh), in 1887. By the Indian Universities Act of 1904 all the universities were given the same form of organization. For the most part the instruction is given in affiliated colleges. Faculties in arts and philosophy, medicine, law, science, commerce, Oriental studies, teaching, and engineering exist. Efforts are being made also to promote technical and agricultural education, the supporters of this plan hoping to establish strong provincial institutions for these purposes. Instruction is usually given in English, though in the Oriental College of the Punjab University instruction is in the vernacular. All the universities enjoy the privilege of affiliation with the University of Cambridge.

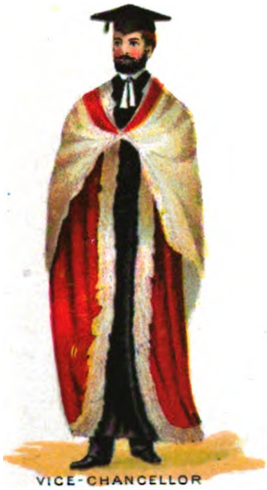
France. French universities take their origin from the University of Paris, the first great university of northern Europe. (See Paris, University of.) In the greater part of the nineteenth century the word "university" had a widely different meaning in France from that which it conveyed in other countries, the term Université de France being nearly equivalent to national system of education of France. (With this may be compared the University of the State of New York.) The French Revolution put an end to the universities of the *ancien régime*, and the attempts of the Convention to establish similar institutions were short-lived. Napoleon organized a comprehensive system of higher education in one unified whole—the University of France. This was placed directly under the control of the government, administered from Paris, and made an instrument of government in the hands of the central power. Higher education was given under 15 faculties in each of the educational districts. These faculties were preëminently examining and degree-conferring bodies. The courses of study were strictly controlled from Paris, and the work was almost wholly of a professional and practical character. This organization, with various alterations, continued until 1896. While the various faculties of law, theology, medicine, science, and literature existed in most of the different educational districts, the so-called academies, in no case save at Paris were they organized into a university. The Law of 1896, which went into effect Jan. 1, 1898, created 15 autonomous universities in place of the previous unified university with scattered faculties, to which a sixteenth was later added in Algiers (1909). While much of the control of the institution is still exercised by the Minister of Education and the authorities at Paris, yet much local autonomy is exercised in respect to examinations, degrees, and supplementary courses of instruction. The support of these institutions is now left largely to the localities, with large subsidies from the state. This stimulates local pride and activity, and many of the localities have made great additions to the material equipment and plant of the institution. Private munificence can now also be accepted, and it has been given in some instances. The universities in the smaller towns, however, have suffered considerably from the change, for while the change has largely increased the student attendance, yet this has been for the most part to the advantage of the universities in large cities, such as Paris, Bordeaux, and Lyons. The local universities are also under the necessity of supporting the course of study given outside of the state programme.

ACADEMIC GOWNS – BRITISH USAGE.


DOCTOR OF CIVIL LAW
OR MEDICINE OF OXFORD.
(FULL DRESS).


DOCTOR OF DIVINITY, OXFORD
(CONVOCATION ROBE)


DOCTOR OF LAWS OR DIVINITY
CAMBRIDGE.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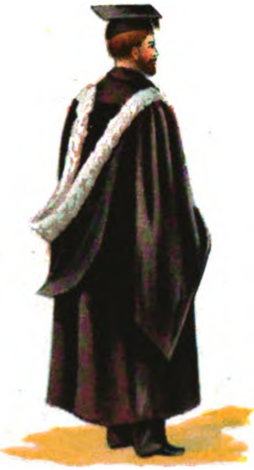
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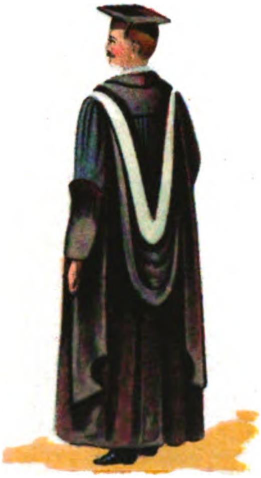
OXFORD.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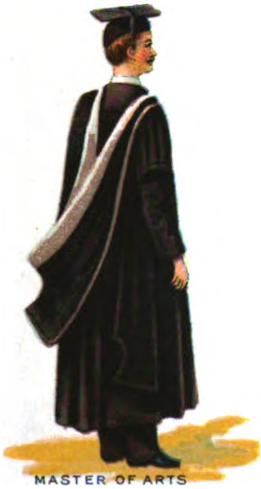
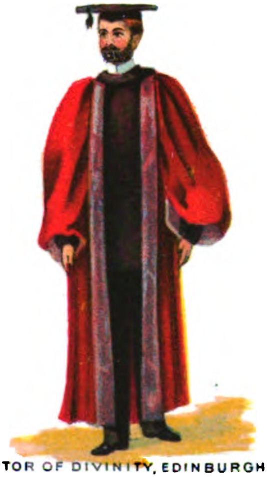
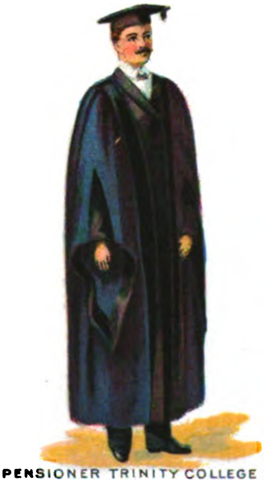

MASTER OF ARTS
EDINBURGH.


DOCTOR OF DIVINITY, EDINBURGH
(FULL DRESS).


PENSIONER TRINITY COLLEGE
CAMBRIDGE.

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ARRANGED BY GARDNER COTRELL LEONARD, B. A., INTERCOLLEGIATE BUREAU, ALBANY, N.Y.

The reform of 1896 was quite as important in regard to methods of study as in regard to administration. New emphasis is laid upon the work of investigation. The professional student is now given an opportunity for doing this, and in some faculties is expected to do it previous to receiving a degree. The change has especially benefited the faculty of science and arts, which previously had had no regular students, since all courses were public and free and were consequently attended chiefly by chance comers. The same reform provided for the opening of the universities to foreigners and the reëstablishment of the doctorate. The attendance of foreigners, especially Americans, has increased constantly since the reforms were instituted, there being, in 1912, 5569 of these. The number of professorships has also been largely increased. Not all the universities are equipped with all the faculties. There are only eight complete faculties: Paris, Bordeaux, Lille, Lyons, Montpellier, Nancy, Toulouse, and Algiers. A few have no complete medical faculties and only preparatory medical schools. In addition to the faculties a number of universities have also schools of pharmacy.

Germany, Austria, and Switzerland. The early German universities were modeled after the University of Paris, though the University of Bologna had considerable influence on the universities of the South German States; and it is in the German universities that the general organization or structure of the mediæval universities is best preserved. Unlike the early universities of France and Italy, those of Germany were not of gradual growth, but were all created and chartered by both King and Pope and often by the Emperor as well. There were seven of these founded in the period to which all the early universities belong, that is, to the period previous to the Renaissance movement. The earliest of all was that of Prague, authorized by Pope Clement VI in 1347, and by the Emperor Charles IV in the following year. Then followed Vienna, in 1365; Heidelberg, in 1386; Cologne, in 1388; Erfurt, in 1393; Leipzig, in 1409; and Rostock, in 1419. It is only this group of German universities that incorporated the original organization into nations, and even in these the nations ceased to have any essential importance in the sixteenth century. Leipzig grew out of a secession of 5000 students and teachers from Prague, owing to hostility between the German and Bohemian students, and consequently the organization into nations was important, and continued to exist as a form until the nineteenth century. All these universities yet exist, save Cologne and Erfurt, which disappeared during the period of the French Revolution. The humanistic movement of the fifteenth and early sixteenth century produced nine new universities, four of which, Greifswald, Freiburg, Basel, and Tübingen, still exist. One of the others, Wittenberg (founded 1502), was the most influential of all during the latter part of the sixteenth century.

The third period in the history of German universities is that of the Reformation and Counter-Reformation, to the close of the seventeenth century. Twenty new foundations date from these two centuries, 10 of them Protestant and 10 Roman Catholic. Half of each group have ceased to exist or continue merely as theological faculties under the control of the Church. These foundations were due for the most part to the territorial divisions caused by the religious dissensions, and throughout the period religious interest dominated all the universities, old and new. Consequently the influence, the spirit of the teaching, the manner of life was much more restricted during this period than in any other. The theological studies dominated. Towards the close of this period the universities of Germany sank to the lowest level of influence and importance, nor was the character of the work much higher. The court schools and circles of learning outshone the universities themselves.

The new era of the eighteenth century was ushered in by the foundation of Halle (1693) and Göttingen (1737). These two institutions marked the recovery from the stagnation of the seventeenth century. Halle was established in the interest of Lutheranism to combat some of the religious tendencies of the time, but soon outgrew the bounds originally set for it, especially under the influence of the famous Thomasius and Francke. Thomasius was the first to abandon the use of Latin for German in the lecture room, and his example was soon followed to a greater or lesser extent throughout Germany. A further characteristic of this period was the dominance of the new rationalistic philosophy over the old scholasticism. The new philosophy recognized no bounds of authority, and the spirit of inquiry now came to be the dominant spirit of the universities. Instead of the merely formal study of the ancient classics, the various branches of philology were now recognized and pursued. The critical study of history also began. Halle and Göttingen dominate the eighteenth century and are recognized as the first universities of the modern type.

The present period, in which the scientific spirit of the nineteenth century is preëminent, opened after a period of upheaval consequent upon the Napoleonic wars. Nine of the old universities were suppressed and four combined with others. One of the measures adopted by the Prussian government was the reformation of existing universities in the direction of greater freedom of thought, and the founding of the new University of Berlin in 1809. The influence of Berlin on other German universities has been paramount. Many antiquated and useless features have been abandoned and during the past century professorships in every branch of learning were established. The University of Bonn was founded in 1818 and has rapidly gained preëminence, especially in philosophy and philology. A late venture in the progress of higher education in Germany was the establishment of the University of Frankfort, the first institution of its kind maintained by private and municipal funds. The university was opened for instruction in 1914.

The German universities are strictly state institutions and are subject to the ministry charged with the educational supervision of the respective states in which each is situated. Each, however, enjoys a high degree of autonomy and their constitutions are essentially republican. The internal administration of the university is in the hands of a rector, or, in case this title is borne by the sovereign, a prorector, a dean of each faculty, the *senatus academicus*, and the quæstor or treasurer. The discipline of the university over its students is maintained by means of a University Court, composed of certain members of the faculty of law. The penalties inflicted are reprimands, fines, imprisonment in the University *Carcer*, deprivation of credit, suspension, and expulsion, the two latter holding good not only for the one but for all German universities. Aside from this the university exercises no control over its students, and there are, save in a few exceptional instances, no such institutions as colleges, halls, or dormitories. The term faculty signifies either (1) the teaching body, especially the full professors, or (2) the teachers and students in one of the great divisions of the university. At every German university there are faculties of law, medicine, philosophy, and either Protestant or Roman Catholic theology. In a few, such as Munich and Strassburg, an additional faculty in political science or in natural science has been organized. The teaching body of a German university consists of (1) full professors (*ordinarii, ordentliche Professoren*), (2) extraordinary professors (*ausserordentliche*), and (3) *Privatdocenten*. To these are to be added (4) readers (*lectoren*), appointed to give practical instruction in modern languages; there are also (5) masters of dancing, fencing, riding, etc., whose connection with the university is often merely nominal. The full professors are the occupants of chairs intended to be permanent foundations; they alone sit in the *senatus academicus*, and are alone eligible to the rectorship and deanships. The extraordinary professors are either younger men, to whom the professorial title has been granted by the government for distinguished work, or they represent subjects in which no permanent chairs have been established; sometimes both conditions are exemplified in the same individual. The *Privatdocenten* are graduates who receive permission to lecture, but receive no official appointment and depend for their remuneration for the most part upon fees received from students. They are not subject to the authority of the professors, but from them are selected the *ausserordentliche Professoren*.

The only degrees given by the German universities at the present day are those of doctor and licentiate; the latter is given only in theology. The university degrees do not, as such, admit the recipient to the exercise of his profession in the Church, law, medicine, or the higher teaching service; for this, the passing of the state examination is necessary.

For a list of German, Austrian, and Swiss universities, see articles on the respective countries. The principal universities are described in separate articles.

Italy. During the Middle Ages the university movement had its origin and received its greatest impulse from Italy. The importance of Bologna in this respect has been discussed under the section on *Mediæval Universities*. Again, during the fifteenth and sixteenth centuries the Italian universities were the most important centres in all Europe of the new humanistic studies. While the new methods and subjects of study introduced by these Italian universities produced a complete academic revolution and paved the way for the Reformation, they possessed a fortunate immunity from dissensions like those which distracted the centres of learning in northern Europe, especially Germany. The status of the professors in Italy was higher than in any other country. Nevertheless the universities suffered greatly from the general decline of the seventeenth and eighteenth centuries and did not recover with the early nineteenth, as did those of the Northern European countries. While they preserved their ancient organization and local independence, they suffered both from a great decrease of revenue and from the political disturbances of the Italian States. After the political unification of Italy in 1870 the government nationalized the universities, by assuming their support and management and confiscating their property. Since that time the universities are included as a component part of the public system of education. There are seventeen of these state universities and four free universities—that is, supported by the local districts and municipalities. Consequently the opportunities for higher education are very much in excess of the needs of the population. Very few of these universities possess theological faculties, and the theological studies are little valued. Education for the Church is given in seminaries controlled by the Church and in its ecclesiastical character is most complete. The theological schools of Rome draw students from all quarters of the world, and in conjunction with them there is a system of national colleges for the students of the several countries. Faculties of philosophy do not exist in the free universities and are poorly attended in the state institutions. The faculties of medicine and of law possess an overwhelming preponderance of all students. The state universities are those of Bologna, Cagliari, Catania, Genoa, Macerata, Messina, Modena, Naples, Padua, Palermo, Parma, Pavia, Pisa, Rome, Sassari, Siena, and Turin. The free universities are those of Camerino, Ferrara, Perugia, and Urbino.

Holland and Belgium. The universities of the Netherlands, which, like the later foundations of Germany, grew out of the Reformation struggles, were founded by the state for the especial purpose of training the clergy.

The Dutch universities are Leyden, Groningen, Utrecht, and Amsterdam, the last founded in 1877. These universities possess a uniform organization and with the exception of Amsterdam, which is not state maintained, are completely controlled by the state. The subjects of study and the examinations are determined by statute. Consequently there is little individuality among the universities and little to lead a student to prefer one institution to another. There are no colleges or halls, and no oversight of the students by the faculty. The Dutch universities are closely modeled after the German, but do not possess their flexibility. The character of student life, of methods of instruction, of conditions of examinations, of degrees conferred, closely approximate that of the German universities. There is in addition to these a free university at Amsterdam founded in 1880 and now having about 150 students in faculties of theology, letters, law, and medicine. It is supported by private benefactions.

Belgium had four universities, two of which, Liége and Ghent, were state universities similar to those of the Netherlands, while Louvain was controlled by the Roman Catholic church, and Brussels was a free establishment.

Spain and Portugal. There were in 1916 nine universities in Spain, an additional law faculty at Oviedo, and a medical faculty at Cadiz. The universities are located at Barcelona, Granada, Madrid, Salamanca, Santiago, Seville, Valencia, Valladolid, and Saragossa.

Each possesses two or more of the faculties of law, medicine, pharmacy, and science. Tuition charges are high and the universities depend almost wholly upon this source of revenue. For the most part the Spanish universities resemble in organization the French faculties previous to the reforms of 1896 and are not in a flourishing state. The largest is that of Madrid, with 125 professors and nearly 6000 students in 1914. Portugal has two universities. There are faculties of law, medicine, mathematics, philosophy, and a school of design at Coimbra. Lisbon, which was reëstablished in 1910, has faculties of arts, sciences, and medicine, and a school of pharmacy. See Coimbra, University of; Alcalá de Henares; Madrid, University of; Salamanca, University of; Valencia, University of; Valladolid, University of.

Russia. Russian universities are of two classes: those that are practically universities of the German type and date from the Reformation period, and those typically Russian. There are two of the former: Dorpat, founded in 1632 (see Yuriev, University of), and Helsingfors, in Finland, founded in 1640 by Queen Christina. The latter is a flourishing institution in the midst of a cultured people possessing a system of universal and compulsory education. Both the population which supports it and the institution itself are more closely allied to the Scandinavian countries than to Russia. The nine Russian universities are as follows: Moscow, founded in 1755; St. Vladimir at Kiev, founded in 1833; Kazan, founded in 1804; Kharkov, founded in 1804; Warsaw, founded in 1816; St. Petersburg, founded in 1819; Odessa, founded in 1865; Tomsk, founded in 1888; and Saratov, founded in 1909. In most of them the faculties are of history, science, jurisprudence, medicine, and languages. The attendance, excluding Saratov with about 400 students, varies from about 10,000 at Moscow to about 1000 at Tomsk. In addition to the universities there are six theological schools and various medical and technical schools not represented in the university faculties.

Greece. No institutions of higher learning existed in Athens during modern times until after the liberation of the Greeks in the early part of the nineteenth century. In 1837 King Otho established the University of Athens, closely modeled after the universities of Germany. The four faculties of law, medicine, theology, and philosophy were created, with the power of appointment lodged with the King, who appointed mainly Germans. Since 1882 the right of nomination has been exercised by the faculties.

Scandinavia. All state institutions since the Reformation have been strongly Lutheran in their character and are closely associated with the national church. They were founded on the model of German universities and for the most part reproduce the present features of these. They are as follows: Upsala, in Sweden, founded in 1477; Copenhagen, in Denmark, founded in 1479; Lund, in Sweden, founded in 1666; and Christiania, in Norway, founded in 1811. The attendance varies from 4000 at Copenhagen to nearly 1400 at Lund. In addition to these universities there are in Sweden a state medical faculty at Stockholm, and private philosophical faculties at Stockholm and Göteborg.

United States. In the United States popular usage employs the terms "university" and "college" indiscriminately for any higher institution of learning which possesses the power of conferring the usual academic degrees. This confusion prevails also in official nomenclature, for some of the oldest, richest, and most completely equipped American universities still bear the name of "college," while in certain parts of the country institutions inferior in endowment and in scholarly distinction to some of the secondary schools are officially designated as "universities." Harvard and Yale, though long since equipped with the amplest facilities for university work, have only very recently put aside the name of "college," and the same is true also of Columbia and Princeton.

Classified with reference to their pedagogic character, American universities may be roughly grouped under two general heads: (1) universities that are equipped for the prosecution of original investigation and research in the various departments of study, besides usually having connected with them the various professional schools, representing the faculties of law, medicine, theology, and natural science; and (2) universities, so called, that perform chiefly the disciplinary and preparatory work similar to but somewhat more advanced than that of the German Gymnasium (q.v.). Institutions of the second class have a course more or less prescribed (see Elective Courses and Studies), leading to the degree of bachelor of arts, and in some cases to the alternative degrees of bachelor of science, bachelor of letters, or bachelor of philosophy. With the granting of such degrees the responsibility of the institution usually ends, though some of the universities offer facilities for advanced lines of study. But in all, the "undergraduate courses" leading to the baccalaureate degree form the most important portion of the curriculum.

Of the former class, to which in the best usage the term university is now restricted, are Harvard, Yale, Columbia, Princeton, Johns Hopkins, Clark, Pennsylvania, Leland Stanford, Chicago, Cornell, New York, the Catholic University of America at Washington, and a large number of State universities such as Michigan, California, Wisconsin, and Illinois. However, in most of these less stress is laid upon the collegiate work than upon the more original work performed by those who have already received the first degree in arts and science, and who are consequently engaged in the special or professional investigations that are to fit them for their life's work. In the remainder of these, and in many similar institutions bearing the name university, the chief emphasis is upon the undergraduate work, though the advanced and progressive work is also represented and the title of university is appropriate. Such are the State universities of Virginia, California, Michigan, Indiana, Minnesota, and several other States, Boston University, and Princeton University. So far as the advanced work is carried in these institutions, it is in no wise inferior to that of institutions laying the chief stress on graduate investigation and instruction. In no case is there an institution comparable to the universities of Oxford and Cambridge, made up of constituent colleges doing undergraduate work; nor, on the other hand, universities in the German sense of the term.

The influence of the German universities, however, was most instrumental during the development of advanced instruction in American institutions. The first American to graduate at a German university was Edward Everett, who received his doctor's degree at Göttingen in 1817. During the next few years this example was imitated by four or five others, among them George Bancroft, who received his degree in 1820. Not until after 1840, however, were any great number of American students attracted to the German universities. From that time a constantly increasing number pursued such a course and returned to affect immediately the work of American institutions. As early as 1800 Harvard College had accepted resident graduates, and announced their names as students. A varying number, never over 12, continued each year until 1860, when Harvard first definitely announced in its catalogue that such students would be accepted and provided for, and three years later announced a series of graduate courses.

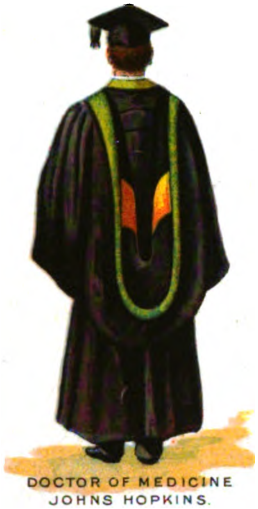
Meanwhile Yale College had preceded Harvard in the development of graduate work. In 1847 a "department of philosophy and arts" was organized for "scientific and graduate study." This department was expanded until in 1860-61 it was divided into (1) the Sheffield Scientific School and (2) the special courses in philology, history, philosophy, etc., and the announcement was made that the degree of doctor of philosophy would be conferred, as was done for the first time at the close of that year. In 1872 the graduate work was organized into a separate department, as the first distinct graduate school. In the same year Harvard announced that it would confer the advanced degree, but it was not until 1890 that a separate graduate school was organized. Other institutions, such as Columbia, Michigan, Cornell, and Princeton, soon followed the example of the older institutions in providing for advanced degrees and in the case of the master's degree some even preceded the older institutions. In the case of Cornell University, opened in 1868, the graduate work and graduate degrees were planned from the beginning. Johns Hopkins University, founded in 1876, was the most influential of all factors in developing university work similar to that of the German universities. Here first was found an institution devoted chiefly to the training of advanced students; here first were found the opportunities for research along the line of all the social and natural sciences, literature, and philosophy; here first was the organization of work similar to that of German institutions and the same freedom and opportunity of wide choice given to the student. For many years the men trained at this university exerted the greatest influence towards the introduction of similar work in other institutions where the university work was developing out of the old collegiate work. A second great influence was that exerted by Harvard University during the incumbency of President Eliot. Nowhere else was the close and beneficial relationship that may exist between the graduate and undergraduate work so demonstrated. A similar influence was exerted upon State universities, and by the graduate instruction both in natural and the social sciences by Cornell University, ample provisions for which were made at its foundation in 1868. More recently several other institutions have vied with these in the importance of their university work, notably two, which now lead all the others in graduate attendance, namely, Columbia University and the University of Chicago. Columbia as reorganized in 1890 provided for graduate work, in a graduate faculty of philosophy, of political science, and (in 1893) of pure science. Since then the faculty of medicine and the faculty of law and the faculty of education (see TEACHERS COLLEGE) have become graduate faculties. In numbers pursuing graduate studies this university now leads. The University of Chicago, founded in 1891, has laid the greater emphasis upon graduate work from the beginning, and has introduced a number of novel features, some imitations of features of English universities, some of German, and some original. Several of these, such as the continuous session, and the publication department, as an important phase of the university work, seem destined to come into general acceptance.

The degrees conferred by universities for advanced work are usually those of master of arts (A.M.) and doctor of philosophy (Ph.D.), though sometimes the master of science (M.S.) and the doctor of science (D.S.) are also given. The tendency now in both the graduate and undergraduate work of universities is towards giving a single degree (A.B., A.M., and Ph.D.) upon the completion of any one of a number of allied courses. The requirements for the master's degree show considerable variation among the different institutions. The degree usually indicates one year of resident graduate work beyond the bachelor's degree, though it is still frequently given *honoris causa*. The minimum for the doctor's degree is two years' work beyond the baccalaureate, including the preparation and usually the publication of a thesis. In most cases the doctorate requires three years of graduate work. In 1873 there were 43 doctorate degrees conferred, 25 of which were upon examination. By the close of the century this number had increased to from 300 to 350 each year, with less than five per cent given *honoris causa*. In 1914 in 567 institutions 5248 graduate degrees were conferred, while in 46 of the leading institutions 519 degrees of doctor of philosophy were gained. The graduate students in the same year numbered 13,094. See DEGREE.

Complete freedom of choice is naturally given to the student in the selection of his studies, as is now the usual or at least the frequent custom in undergraduate studies. (See ELECTIVE COURSES AND STUDIES.) Consequently the A.B. degree as well as the Ph.D. does not indicate the mastery of any particular subject or subjects. The German custom of requiring the student to select a major and one or two minor subjects prevails in most universities, though Harvard and Yale simply require that the kind and amount of the work be satisfactory to the appropriate committee. The present tendency in other institutions is away from this division into majors and minors. The amount of time or number of courses included in a major or minor varies with the university. A major for a doctor's degree ordinarily represents two courses of two or three or four hours weekly for two or three years, as the case may be. It is often more in amount. The minor is ordinarily one-half of the above requirement. The greatest variety of choice is offered the student for his selection of majors and minors.

The teaching staff is composed of professors, adjunct or associate professors, assistant pro-

ACADEMIC GOWNS — AMERICAN USAGE.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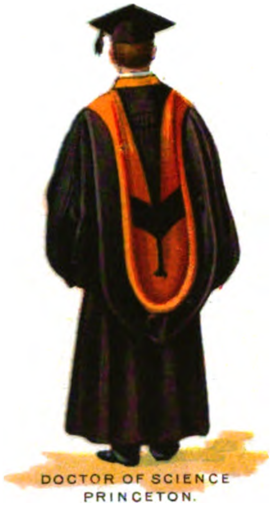
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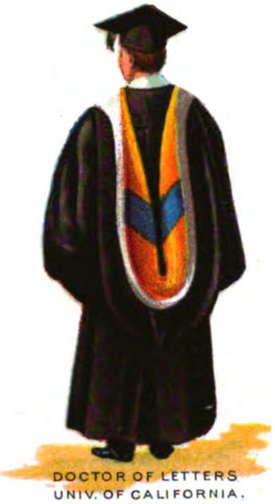
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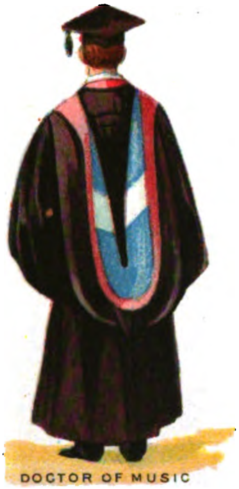
UNIV. OF CALIFORNIA.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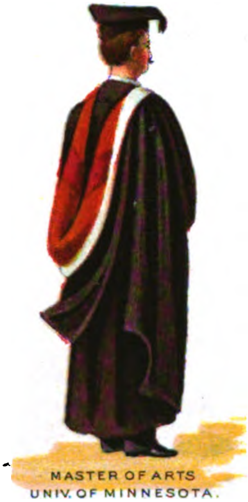
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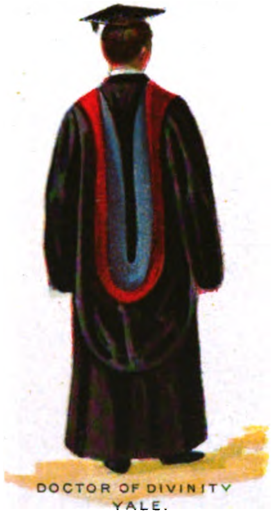
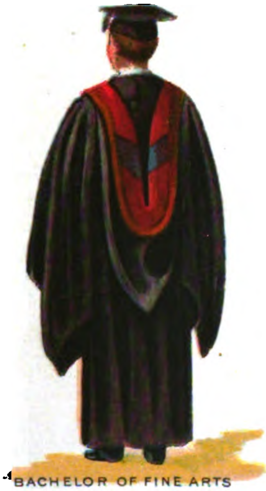
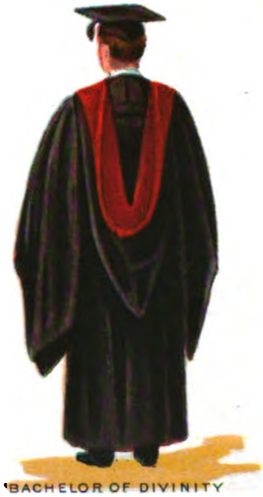
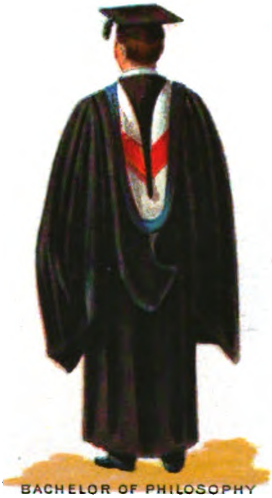

DOCTOR OF DIVINITY
YALE.


BACHELOR OF FINE ARTS
UNIV. OF PENNSYLVANIA.


BACHELOR OF DIVINITY
UNIV. OF CHICAGO.


BACHELOR OF PHILOSOPHY
WESTERN RESERVE UNIV.

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fessors, instructors, tutors, and assistants. The American professor is always a teacher, and the amount of his time that must be devoted to actual lecturing and teaching is usually prescribed for him by the college regulations; it is ordinarily from eight to twelve hours per week. He has not the privilege accorded to the German professor, of "reading" or not, but must every year go through a certain number of courses of instruction, besides being expected, in many of the colleges, to assume a certain amount of responsibility for administration, and the morals and discipline of the undergraduates. This is a very serious obstacle in the way of his ability to carry on independent investigation and research, and makes the American professoriate a comparatively sterile body, though an improvement in this respect has been very noticeable in the past few years. The university instructor is now expected to be not only a director of investigation and an investigator himself, but he is also expected to publish the results of his investigations. The same kind of work is also coming in increased amount from the colleges, though there the instructor must spend the greater part of his time (from 15 to 20 hours per week) in class instruction. Harvard, Yale, Chicago, Cornell, Columbia, Johns Hopkins, Clark, and other universities have now largely adopted the German conception of the professorial function, and allow the individual professor much greater liberty in the discharge of his duties than was formerly the case. Most of the leading universities have likewise adopted the laudable plan of allowing each professor leave of absence once in seven years, either a full year on half pay, or a half year on full pay, with many variations on this plan.

In organization the universities differ considerably, especially as to detail and local arrangements. In general the organization is into faculties of philosophy, pure science, applied science, medicine, law, etc., presided over by deans, who are administrative rather than educational heads; the faculties are divided into departments, of Greek, mathematics, etc., presided over by a head professor, who usually exercises a general control over the work of the department. To him the associate professors, tutors, etc., in the department are responsible. He arranges the subjects of study, assigns the work of the subordinate instructors, and reports to the president or chancellor from time to time upon the work accomplished. In other universities the departmental organization is wholly democratic, in which the only headship is the formal one of seniority. The president (or chancellor) exercises a general supervision over the entire institution, and is the medium of communication between the faculty or faculties and the trustees, overseers, regents, or governors of the university—a body with whom usually rests the ultimate sovereignty of the institution, and who have exclusive control of the finances.

The organization of the professors and instructors in American universities differs widely. In the institutions where most of the work is in arts and science there is generally a single faculty. In the larger universities the faculties are often wholly distinct, the president acting as the only bond between them. Each faculty, then, legislates independently of the others on matters affecting its own local interests, while questions affecting the university as a whole are left largely to the board of trustees, advised by the president and sometimes by the faculties.

The United States Commissioner of Education in his report for 1913–14 gives statistics for 567 universities, colleges, and schools of technology of degree-giving rank. Of these 474 are controlled by private corporations and 93 by State or municipal authorities. Four hundred and seventy-five of these are colleges and universities for men or for both sexes; of these 330 are open to both men and women, and 145 admit men only to the undergraduate department. The total attendance in these institutions for the year 1913–14 was 216,493; of these 139,373 were men and 77,120 were women. These institutions conferred degrees upon 31,781 men and women completing the course of study during that year. The number of professors and instructors in these institutions was 31,312. The total value of the property possessed by the 567 institutions of higher education was $849,396,071; of this sum $362,742,823 consisted of productive funds. The total income of the institutions for the year was $102,156,401, and the additions through private benefactions, $26,670,017.

Since the close of the last and the beginning of the present century a number of organizations have been established to promote and discuss the various interests of American universities. Among these should be mentioned the Association of American Universities, established in 1900 to consider questions bearing on graduate studies; the National Association of State Universities, organized in 1895, to make the represented institutions more efficient; and in 1914 there was founded the Association of Urban Universities to promote the interests of municipal universities and universities existing in large towns. The United States Bureau of Education has in recent years devoted attention through a specialist to higher education. Of privately endowed bodies that have contributed materially to the welfare of American universities the more important are the Carnegie Foundation for the Advancement of Teaching, and the General Education Board (qq.v.). Indirectly contributory to the progress of higher education is the American Association of University Professors, organized in 1915 to safeguard and promote the interests of the teaching profession engaged in universities and colleges.

Denominational Connections of Universities and Colleges. The earliest institutions for higher education in the United States were established to promote the interests of certain denominations and more especially for the training of ministers. Thus Harvard and Yale were closely connected with the Congregational churches, King's College (now Columbia University) with the Episcopal church, Princeton with the Presbyterian, Brown with the Baptist, Wesleyan with the Methodist, and Rutgers with the Dutch Reformed. The expansion of the purposes and functions of the colleges and universities, the development of State universities, the requirements of the Carnegie Foundation for the Advancement of Teaching, were several among many reasons for the abandonment of close administrative relations between these institutions and the denominations. While nearly every denomination in the country has its representative institutions for higher education, a few have established central authorities to aid in the maintenance, promote the standards, and supervise the instruction and religious life of their institutions. The chief of these boards are the Presbyterian Board of Aid for Colleges and Academies or the Presbyterian College Board, established in 1883; the Board of Education of the Methodist Episcopal church, organized in 1864; the Board of Education of the Methodist Episcopal Church South, founded in 1894; the Congregational Education Society, organized in its present form in 1896 and amalgamating a number of boards throughout the country, one at least dating from 1816; and the Board of Education of the Reformed Church of America, which began its activities in 1828, was reconstituted in 1832, and incorporated in 1869. All the boards mentioned are now devoting themselves to the task of consolidating and coördinating the efforts of their respective denominations, eliminating competition among small, struggling institutions, and raising the standards.

The ecclesiastical control over institutions of higher learning in the Roman Catholic church is of a different character. Here there is no central board or society that exercises powers of supervision over all the colleges of the church. The connection is maintained through a large number of religious orders that not only support but own the institutions under their care. Each order is, of course, under the supervision of its superior or council. In 1899 there was founded an Association of Catholic Colleges of the United States with a membership of 53 colleges, a number nearly doubled since that date. The association in 1904 became the college section of the Catholic Education Association. The leading institution in the section is the Catholic University of America (q.v.). With few exceptions the other institutions are under the control of one of the religious orders of the church devoted to teaching. The leading orders of men are the Society of Jesus, the Brothers of the Christian Schools, the Benedictines, the Vincentians, the Oblates of Mary Immaculate, the Marist Fathers, the Congregation of the Holy Cross, the Brothers of the Sacred Heart, and the Xaverian Brothers. The chief communities of women conducting colleges include the Sisters of Notre Dame, the Sisters of Notre Dame of Namur, Sisters of the Holy Cross, Sisters of the Holy Names, Ursulines, Sisters of Charity, and Sisters of Providence. The institutions maintained by these orders are chiefly of college rank and confine themselves in the main to imparting a liberal rather than a professional education. The leading universities are, besides the Catholic University of America, Georgetown (Washington, D. C.), Notre Dame (Notre Dame, Ind.), Loyola and DePaul (Chicago), St. Louis (St. Louis), Fordham (New York City), Creighton (Omaha), Marquette (Milwaukee), Detroit (Detroit). Catholic colleges having a registration in 1915 of 300 or more include: St. John's (Brooklyn), Holy Cross (Worcester, Mass.), St. Mary's (Oakland, Cal.), St. Ignatius's (Cleveland, Ohio), St. Mary's (Dayton, Ohio), Dubuque (Dubuque, Iowa), Cathedral College (New York City), St. Mary's (St. Mary's, Kans.), St. John's (a university; Collegeville, Minn.), Mt. St. Mary's (Emmitsburg, Md.), St. Viator (Kankakee, Ill.), Santa Clara (a university; Santa Clara, Cal.), Villanova (Villanova, Pa.), Campion (Prairie du Chien, Wis.), Christian Brothers (St. Louis), Loyola (Baltimore), St. Joseph's (Collegeville, Ind.). There are other well-known Catholic colleges in the United States, as well as in the Philippines and Honolulu. For complete list, consult the *Official Catholic Directory* (New York, 1916).

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UNIVERSITY CLUB. A social organization, whose members must hold a university or college degree, or one representing advanced education, and who need not all come from one institution. Clubs representing one institution alone are commonly called Alumni Clubs. The earliest University Club in the United States was the University Club of New York City, founded in 1865 and reorganized in 1879; the next the University Club of St. Louis, 1872. By 1915 the number in the United States had increased to over 60. The University Club of New York City is limited to 2000 resident members, 1500 nonresident and army and navy members, and a considerable number of life members. The total in 1915 was 3531. The library contains over 32,000 volumes. Consult J. W. Alexander, *History of the University Club of New York City* (New York, 1914).

UNIVERSITY COLLEGE. A college of Oxford, England, reputed to have been founded by King Alfred. This tradition is repeated on three different occasions: once in a petition to King Richard II; again in 1727, when this tradition was made the ground for vesting the right of visitation in the crown; and as recently as 1872, when the college celebrated the millenary anniversary of the legendary foundation. The historical founder, however, is William of Durham, who died in 1249, leaving 300 marks for the purchase of annual rents for the use of some twelve masters. The actual foundation does not seem to have taken place until 1280, when the first statutes were drawn up. The present buildings of the college, which is situated in High Street, date from 1634; a number of changes and additions were made, however, about 1860. The hall was extended at that date and contains in the centre of its large fireplace a medallion bust of King Alfred. The library, built in 1860, contains large statues of Lord Eldon and Lord Stowell. The chapel was remodeled two years later. A chamber has been specially built to contain Ford's statue of Shelley, who entered the college in 1810. In 1913–14 the college had a master, 13 fellows, 33 scholars and exhibitioners, and 195 undergraduates. Consult W. Carr, *University College* (London, 1902).

UNIVERSITY COLLEGE. The title of a large number of institutions of college grade throughout the British Empire. These institutions do not possess the privilege of granting degrees, but are in most cases affiliated with degree-granting universities. A number of university colleges have themselves been nuclei of universities, e.g., University College of Liverpool. The title is borne, e.g., by the University College, London (see LONDON UNIVERSITY); University College, Reading; University College, Exeter; University College, Southampton; University College, Nottingham. The University of Wales (see WALES, UNIVERSITY OF) consists of three university colleges, as does the National University of Ireland (q.v.). Consult *Yearbook of the Universities of the Empire* (London).

UNIVERSITY EXTENSION. A system of higher education for men and women who are unable to attend higher institutions of learning. University extension work was begun by the University of Cambridge, England, in 1872–73, when, largely owing to the zeal of Professor James Stuart, it offered to supply English towns with capable instructors in various departments of knowledge, under university supervision. The administration of this work was vested in a syndicate instituted in 1873. In 1876 university men in London founded the London Society for the Extension of University Teaching, which was, in 1902, made a department of the University of London. In 1885 the University of Oxford instituted its "Delegacy for the Extension of Teaching Beyond the Limits of the University." This action was the result of the success attained by several of the Oxford colleges in the establishment of "Extension Colleges" at Reading and other English towns. At the present time every university in England is engaged in extension work. Coördinate with the university extension movement is the work done by the Workers' Educational Association, formed in England in 1903, to provide educational opportunities for working men "until they are able to take advantage of the facilities which are and which may be provided by the universities." The association arranges courses and secures leaders from the universities to meet local groups organized throughout the country.

University extension teaching has been introduced, sometimes modified, and carried on in the United States, Germany, France, Belgium, Austria, Denmark, Scandinavia, Russia, Australia, and Canada. In a few instances, notably in the State of New York and in Vienna, the enterprise has received government aid. But in general it has been supported by students' fees, assisted by college grants or private subscriptions.

United States. The subject of university extension was first publicly presented at a meeting of the American Library Association during their session in the Thousand Islands in September, 1887. The English system, as adapted to American local needs, was promptly taken up by librarians in Buffalo, Chicago, and St. Louis. In these and other cities the idea was gradually developed and extended by the coöperation of university graduates with libraries, churches, and other local institutions. In January, 1888, Melvil Dewey, then chief librarian of Columbia University, laid the plan before the regents of the University of the State of New York, and at the University convocation in Albany, July, 1888, advocated university extension in connection with public libraries. In February, 1890, a committee of New York colleges and universities urged the regents to establish, under State supervision, a system of extension teaching. On May 1, 1891, a bill was signed by the Governor of New York appropriating $10,000 for the State organization of university extension. No part of the grant could be used for the payment of lecturers, but only for purposes of organization, supervision, and printing. This grant of $10,000 is the first case on record of a State appropriation for university extension.

In 1890 a few public-spirited citizens of Philadelphia founded the American Society for the Extension of University Teaching. In 1891 followed the Albany movement mentioned above; and upon its opening in 1892, the University of Chicago established an extension division as one of the main departments of its work. Mainly from these three centres university extension in the United States has been carried on, though educational institutions elsewhere in the country have done similar work. Some of the more notable of these are: Johns Hopkins, Brown, Stetson (Fla.), and Northwestern Universities; the State universities of Wisconsin, Indiana, Iowa, Wyoming, Kansas, Michigan, Minnesota, Colorado, and California, etc.; Colby College (Me.); Rutgers College (N. J.); Lowell Institute, Boston; Brooklyn Institute; People's Institute (N. Y.), etc. Teachers College, Columbia University, has also conducted extension classes, and in 1903 Columbia University instituted an extension department, and later took over the administration of all extension courses of the university. In 1913 extension departments had been organized in connection with 43 colleges and universities throughout the country, giving work other than agricultural. Mention should be made of the system of "free lectures to the people" of the New York Board of Education, embodying most of the features of university extension work. The most ambitious plan of university extension is that of the University of Wisconsin, which aims in time to establish local headquarters throughout the State, since it is a State maintained institution, and to provide work which "includes not only such courses as entitle the student to credit at the university, . . . but also short courses and conferences not leading to a degree, and the promotion of a great variety of interests that merge the people, both young and old, in the intimate relations of their daily life." This with the dissemination of literature bearing on local everyday conditions, lectures, and correspondence courses will be the natural extension of the movement. The whole conception of university extension is being broadened so as to place the universities of the country at the disposal, not of those alone who are able to attend as regular students, but of the public at large.

As a system of instruction, university extension involves the following elements:

Features. The course of lectures must be given by one instructor, usually at weekly or fortnightly intervals. The lectures must be correlated, dealing with a particular epoch of history, or author, or school of literature, or section of a department of science, etc. They must be scholarly, as representing the thought of the universities; they must be popular to attract and hold the auditors. The number of lectures in a course varies with different organizations. The unit adopted by Oxford, by the American Society, and by Chicago is the six-lecture course. Cambridge has a twelve-lecture unit, and Columbia a six-lecture unit for its more popular courses, and a thirty-lecture unit for its academic and professional courses. The lectures are frequently illustrated by stereopticon, or by demonstrations. A recent development of the lecture system has been its application for purposes of entertainment or the provision of desirable recreation for popular audiences. This system, adopting the "lyceum" method, provides lectures, musical recitals and readings, singly or in courses. By class is meant the group of people of the audience who remain after the lecture for questions, discussion, and suggestions on the subject of the lecture. Individuals, also, may here get personal advice on their work and reading, and criticism of their essays. In England this type of work has been organized under the term "tutorial" classes as distinguished from the lecture courses. The students' association is a club of students and readers desirous of getting the stimulus that working in common affords. The students' association has its own organization, and its regular programme of work, both before and after, as well as during the lecture course. Systematic guidance in every lecture course is provided in a special syllabus, outlining each lecture, selecting the best books on the subject, offering topics for thought, reading and papers, and illustrative notes, and prescribing the work required for certificates. Traveling libraries facilitate student work in places not provided with adequate library facilities. The central organization usually provides a select library of perhaps fifty volumes of books recommended by the lecturer.

Examinations, Centres, etc. At the close of each course of lectures a written examination is given by the lecturer to auditors qualified and willing to take it. The qualification may be the reading of certain books, the presentation of certain essays during the course, regular attendance, etc. The certificates obtained by successful candidates in these examinations are sometimes valuable in special ways. In England they are credited towards the government requirements for pupil-teachers' standing. In Chicago they count towards the baccalaureate degree of the university. In Columbia the thirty-lecture courses receive the same credit as the corresponding courses within the university. University extension is based on the principle of local initiative. It requires that those who desire to avail themselves of its assistance shall be organized as a centre. By "local centre" is meant a group of people who are willing to adopt extension aims and methods, arranging through a local committee on the one hand and the central organization on the other for systematic courses of extension lectures.

In addition to the above must be mentioned as part of the whole movement of university extension the development of courses by correspondence, many of which count for university credit. The most popular extension courses are those organized in connection with most university extension departments as agencies in the further training of teachers in service. These are arranged at times convenient to the clientele and receive university credit. Hardly less popular are courses and conferences conducted by agricultural departments of colleges and universities for the benefit of farmers.

Consult: Adams, in United States Commissioner of Education, *Reports* (Washington, 1898–1900); A. Mausbridge, *University Tutorial Classes* (London, 1913); L. E. Reber, "University Extension in the United States," in *United States Bureau of Education, Bulletin No. 9* (Washington, 1914).

UNIVERSITY OF CHICAGO. See CHICAGO, UNIVERSITY OF.

UNIVERSITY PLACE. A city in Lancaster Co., Neb., four miles northeast of Lincoln, of which it is a residential suburb, on the Chicago, Rock Island, and Pacific Railroad (Map: Nebraska, H 4). It is the seat of Nebraska Wesleyan University, and of the State Agricultural College, and contains a Carnegie library. Pop., 1900, 1130; 1910, 3200.

UNIVERSITY SETTLEMENTS. See SOCIAL SETTLEMENTS.

UNNA, ṳn'nȧ. A town in the district of Arnsberg, Prussia, 30 miles south of Münster (Map: Germany, B 3). The town has important iron industries. In the vicinity is the great salt mine of Königsborn. Pop., 1900, 14,918; 1910, 17,355.

UNNA, PAUL GERSON (1850–). A German dermatologist, born in Hamburg. He was severely wounded in the Franco-Prussian War of 1870–71. After studying medicine in Heidelberg, Leipzig, and Strassburg, he settled at Hamburg in 1881 and three years later opened a hospital for skin diseases. Unna's investigations in dermatology were many and important. He introduced into medicine the use of ichthyol and resorcin. Successful also as a teacher and writer, he founded the *Monatshefte für praktische Dermatologie* (1882) and *Dermatologische Studien* (1886), of which journals he became editor. In 1889 appeared the *Internationaler Atlas seltener Hautkrankheiten* (with others) and in 1894 *Histologischer Atlas zur Pathologie der Haut*.

UNNATURAL COMBAT, The. A tragedy by Philip Massinger, produced at the Globe in 1619 and printed in 1639.

UNST, ŭnst. The northernmost of the Shetland Islands (q.v.).

UNTER DEN LINDEN, ụn'tẽr den lĭn'den. A famous avenue of Berlin, named from the rows of linden trees with which it is planted. It extends from the Brandenburg gate to the palace of Emperor William I, and is extended thence to the Royal Palace by the Platz am Opernhaus, Platz am Zeughaus, and the Lustgarten, a total length of about a mile. The street is 196 feet broad and is flanked by fine shops, the university, arsenal, and several palaces.

UNTERMEYER, ụn'tẽr-mī'ẽr, Louis (1885–). An American poet and journalist. He was born in New York City, where, after leaving high school, he became identified with his father's jewelry manufacturing business. He joined the editorial staff of *The Masses*, and in the Chicago *Evening Post* conducted a column (half critique, half causerie) under the head "and Other Poems." An ardent propagandist of the new spirit in American poetry, he lectured on this subject at various colleges. Untermeyer is particularly happy in his parodies of the manner of the vers librists and certain other poets. Aside from work of this kind, his verse is known for lyric quality of a high order; in content, much of it is concerned with social and industrial wrongs. His writings include: *The Younger Quire* (1911), a volume of burlesques; *First Love* (1911); *Challenge* (1914); —— *and Other Poets* (1916), parodies.

UNTERMYER, Samuel (1858–). An American lawyer, born at Lynchburg, Va. His family moving to New York City shortly after the Civil War, he was educated at the College of the City of New York and at the law school of Columbia University, from which he graduated in 1878. Admitted to the bar in 1879, he soon displayed unusual ability and eventually rose to a commanding position at the New York bar. As a member of the firm of Guggenheimer, Untermyer, and Marshall, he attained large success as a corporation attorney. His talents were well demonstrated in the Asa Bird Gardiner removal case, the Count de Castellane creditor's suit, and the Dodge-Morse controversy. As a Democrat in politics, he supported the antitrust views of the party, seeking to enforce competition and destroy monopolies. He was prominent in 1912 as the attorney of the Pujo Committee (see Pujo, Arsène), investigating the so-called money trust, and in 1913–14 he aided the Democratic Congress in framing the Clayton Anti-Trust Act (see Trusts). Untermyer became known as a leader of the Jewish race.

UNTERWALDEN, ụn'tẽr-väl'den. A canton of Switzerland (Map: Switzerland, C 2). It is divided into the two half cantons of Nidwalden (112 square miles) and Obwalden (183 square miles), of which the former forms a part of the Engelberg Valley and slopes towards Lake Lucerne; the latter is more elevated, belonging to the region of the Bernese and the Lucerne Alps. The principal river is the Aa. Stock raising and gardening are the leading industries, and dairy products and fruit are the main exports. The two half cantons have separate governments, and are among the most democratic cantons in Switzerland, the legislative power being exercised directly by the people assembled in the Landsgemeinde. The initiative is in force. The canton sends two members to the National Council. The capital of Obwalden is Sarnen, and of Nidwalden, Stanz. Pop., 1910, Obwalden, 17,118; Nidwalden, 13,796. The inhabitants are mostly German-speaking Catholics.

Unterwalden originally belonged to Aargau and Zürichgau. It came under the rule of the Hapsburgs, took part in the uprising against them, and in 1291 concluded an alliance with Uri and Schwyz, which formed the nucleus of the Swiss Confederation. It took part in the formation of the League of Sarnen (1832) and the Sonderbund (1843).

UN'WIN, William Cawthorne (1838–). An English engineer, born at Coggeshell, Essex. He was a student under Sir William Fairbairn, and from 1868 to 1872 was instructor at the Royal School of Naval Architecture. In 1872 he was made professor of mechanical and hydraulic engineering at the Royal Indian Engineering College, and in 1884 professor of engineering at the Central Technical College of the Guilds of London. In 1911 he served as president of the Institute of Civil Engineers. His publications include: *Wrought Iron Bridges and Roofs* (1869); *The Elements of Machine Design* (1882; new ed., 2 vols., 1907–08); *The Testing of Materials of Construction* (1888; 3d ed., 1910); *Development of the Experimental Study of Steam Engines* (1895); *The Life of Hirn*, Watt Lecture (1896); *Treatise on Hydraulics* (1907; 2d ed., 1912).

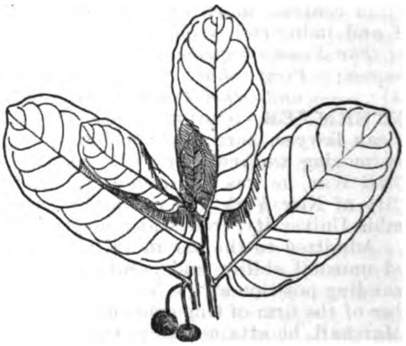
UNYORO, ŭn-yō'rō, or Bunyoro. A district in British Africa, in the Protectorate of Uganda, of which it forms part of the northern province (Map: Congo, F 2). Estimated area, 32,000 square miles; population unknown. In the south the country is hilly and in the north level and heavily wooded. The inhabitants are the Wanyoro, an agricultural Bantu tribe, whose language has extended to other territories. See Uganda Protectorate.

UPANISHAD, ụ-păn'ĭ-shăd (Skt. *upaniṣad*, a sitting down beside, session, esoteric doctrine). The name of a class of Vedic works devoted to theological and philosophical speculations on the nature of the world and man. (For the relation of the Upanishads to the Aranyakas as well as to the Veda, see Brahmanism; Veda; Vedanta.) All Hindu speculation presupposes the theory of transmigration of souls. (See Metempsychosis.) In the oldest Vedic period the Hindu people took a joyous view of future life. Later, however, they acquired the firm belief in karma (q.v.), which appears first in the Satapatha Brahmana, and has since remained an axiom of Hindu thought. The theory of transmigration is coupled in the Upanishads with the equally important theory of the world soul and its presence in all living or organic beings. (See Pantheism.) The human body is supposed to be pervaded by breaths, or atman, which are the individual existence, or ego, and are in turn conceived as flowing from a single atman, the universal ego. All the worlds are merely an emanation of this universal ego. The notion of the atman is further coupled with that of the brahma, "the sacred word, or universal holiness." (See Brahma.) These two ideas, in time, are fused so that in the composite atman-brahma we have two manifestations of the final all-power. Here the atman represents, as it were, the physical aspect, while the brahma stands for the spiritual side of universal life and the ultimate essence. The fundamental doctrine of the Upanishads is the identity of the individual soul (atman) with the world soul (atman-brahma). The formula "that art thou" (*ta tvantnasi*) is the keynote of all Upanishad teaching. It is curious how this doctrine is coupled with metempsychosis. Instead of rejoicing in the knowledge of their own divine essence, the Hindus look upon their individual existence as a condition of separation from the divine essence. The wandering of the soul through the realms of death is the consequence of its separation from the brahma, and salvation, the escape from the chain of successive deaths, can be attained only by reunion with the brahma. The Hindus never sought to explain how the individual souls were separated from the all-soul; they took this for granted. Desire, or clinging to life, is the reason why this separation continues. The only cure for desire is knowledge, or, perhaps better, recognition of the unity of the ego with Brahma and the ever-present recognition of the divided condition of everything finite. Thus the ultimate attainment for man is this recognition, which is salvation through the penetrating knowledge of one's own divine nature, which effaces the entire delusion of individual existence.

The date of the Upanishads is quite uncertain, but the earliest of them are hardly later than 600 B.C., since their most important ideas appear in an advanced and somewhat decayed state in the Buddhist writings. The older Upanishads are the products of Vedic schools. The two most important, the *Bṛhadāraṇyaka* and the *Chāndōgya*, belong respectively to the White Yajur Veda and the Sama Veda; the *Āitarēya*, *Kāiṣītaki*, *Tāittirīya*, *Kāṭhaka*, and *Māitrāyaṇīya* or *Manava* belong to schools of the same names. The *Kēna* and *Talavakāra* Upanishads also belong to the Sama Veda, the *Iśa* to the White Yajur Veda, the *Švētāśvatara* and the *Mahānārāyaṇa* to the Black Yajur Veda. A large and indefinite number of Upanishads, of which the *Muṇḍaka*, *Praśna*, and *Māṇḍūkya* are the most important, are counted as belonging to the Atharva Veda. The most authoritative list counts 27, but later Upanishads are generally counted as belonging to the Atharvan. A complete list of Upanishads is impossible, because the term does not mean a closed canon, but rather an indefinitely extensible type of literature which may be continued in the present or future. In 1876, 235 Upanishads were enumerated, including apocrypha, one of those actually a Mohammedan treatise called *Alla Upaniṣad*. The later Upanishads may be divided into five classes: (1) Pure Vedanta Upanishads, which combine the Vedanta doctrines of the older texts without undue development of the notions of *Yōga* (concentration and abstraction from all mundane matters) or *Samnyāsa* (asceticism); (2) Yoga Upanishads, which presuppose the Vedanta ideas, and in addition advise mental concentration upon the sacred syllable *ōm* (q.v.); (3) Samnyāsa Upanishads, which recommend and describe a life of asceticism as the practical way of attaining the purpose of the Upanishads; (4) Siva Upanishads, which interpret the popular god Siva (q.v.) as a personification of the atman; (5) Vishnu Upanishads, which interpret Vishnu (q.v.), or one of his avatars (see AVATAR), as divine or human manifestations of the atman. See HINDUISM; INDIA, *Religion;* ETC.

Bibliography. Editions of individual Upanishads are extremely numerous in India. A select list is given by A. A. Macdonell, *History of Sanskrit Literature* (London, 1913). A convenient edition of 108 Upanishads was edited by Tukaram Tatya (Bombay, 1895). Among translations the following may be cited: Max Müller, *Sacred Books of the East*, vols. i, xv (2d ed., Oxford, 1900); Deussen, *Sechzig Upanishads des Veda* (Leipzig, 1897); and those of Mead and Chattopâdhyâya (2 vols., London, 1896), and of Sastri, Jhâ, and Seshacharri (5 vols., Madras, 1898–1901). Consult: Deussen, *Die Philosophie der Upanishads* (ib., 1899; Eng. trans. by Geden, Edinburgh, 1906); Gough, *The Philosophy of the Upanishads* (London, 1882; 3d ed., 1903); Jacob, *Concordance to the Principal Upanishads and Bhagavadgîtâ* (Bombay, 1891); H. Oldenberg, *Die Lehre der Upanishaden und die Anfänge des Buddhismus* (Göttingen, 1915).

UPAS, ū'pas (Malay *ūpas*, poison), *Antiaris toxicaria*. A tree of Java, the Philippine Islands, and adjacent regions, of the family Moraceæ, to which also belong the breadfruit, mulberry, etc. The fruit is a kind of drupe, covered with fleshy scales. The Malays mix the milky juice of this tree with black pepper and the root juices of galenga and ginger for tipping arrows. The fibre of the bark is sometimes made into cloth, but unless it is thoroughly cleaned garments made of it are said to produce itching. Some botanists believe that the tree whose bark is used for fibre is a distinct species, as other species of this genus are innocuous. The story was once common of a poison vale in Java, in which the exhalations of numerous poison trees destroy all animal life, and even all other vegetable life. The presence of noxious gases in these volcanic valleys is believed to have been responsible for the origin of this legend.



UPAS TREE.

UP'COTT, WILLIAM (1779–1845). A famous English collector of autographs, a natural son of Ozias Humphry, one of the greatest English miniaturists. He was brought up to the book trade; and when Richard Porson (q.v.), the Greek scholar, was appointed librarian in the London Institution Upcott became his assistant (1806). He resigned in 1834, and lived at Islington. At his home, known as Autograph Cottage, he collected over 32,000 letters illustrated by 3000 portraits. After his death these and other valuable manuscripts were sold, and many of them have found their way into the British Museum. Upcott published a *Biblio-*

graphical Account of the Principal Works Relating to English Topography (3 vols., 1818); revised for the press *Evelyn's Diary* (1818); edited Evelyn's *Miscellaneous Writings* (1825); and engaged in much other literary and antiquarian work.

UPERNIVIK, o͞o-pĕr′nĭ-vĭk, or **UPERNAVIK**. The most northern Danish district in Greenland, on Baffin Bay, in which is situated Tasiusak, 73° 22′ N., the most northerly civilized settlement of the Western Hemisphere. The town Upernivik, with a mission station, is on a small island just off the coast in latitude 72° 48′ N., and longitude 55° 54′ W. (Map: Arctic Regions, G 6). The mean temperature here is 5.8° F. in January and 40.5° F. in July.

UPHAM, ŭp′am, Charles Wentworth (1802–75). An American Unitarian clergyman. He was born at St. John, N. B.; graduated at Harvard (1821) and at Harvard Divinity School (1824); and became colleague pastor, with the Rev. John Prince, of the First Unitarian Church, Salem, Mass. There he remained until 1844, when he was compelled by loss of voice to leave the ministry. Subsequently he was mayor of Salem (1852); was several times a member of the State Legislature, being president of the Senate in 1857–58; and in 1853–55 was a member of Congress. He published: Letters on the *Logos* (1828); *Lectures on Witchcraft, Comprising a History of the Salem Delusion, 1692* (1831; enlarged ed., 1867); *Salem Witchcraft and Cotton Mather, a Reply* (1870); and *Lives* of Sir Henry Vane (1835), J. C. Frémont (1856), Francis Peabody (1869), and Timothy Pickering (1867–72). He also edited the *Christian Review* and *Christian Register*.

UPHAM, Samuel Foster (1834–1904). An American Methodist Episcopal clergyman and theologian, born at Duxbury, Mass. He graduated from Wesleyan University in 1856 and then entered the ministry. In 1865 he was chaplain of the Massachusetts House of Representatives, and from 1881 till his death he was professor of practical theology in Drew Theological Seminary. A speech made by him was largely responsible for the abolition of the time limit in the Methodist ministry. He was secretary of the Commission on the Constitutional Law of the Church from 1896 to 1900. In 1900–04 he was chairman of the committee on the revision of the *Methodist Hymnal*. He served also as president of the Martha's Vineyard Campmeeting Association. He was noted for his wit as well as for his ability as a preacher and leader.

UPHAM, Thomas Cogswell (1799–1872). An American Congregational theologian. He was born at Deerfield, N. H., and graduated at Dartmouth College (1818) and at Andover Theological Seminary (1821). He taught Hebrew at Andover (1821–22); was a pastor in Rochester, N. H. (1823–24); and served as professor of philosophy and instructor in Hebrew at Bowdoin College (1825–67). His *Manual of Peace* was one of the first suggestions of international tribunals. He published: *Elements of Intellectual Philosophy* (1827); *Elements of Mental Philosophy* (1831); *Treatise on the Will* (1834); *Outlines of Disordered and Imperfect Mental Action* (1840); *Lives of the French Mystics, Madame Guyon and Fénelon* (1847), and *Madame Catharine Adorna* (1856); *The Life of Faith* (1848); *A Treatise on the Divine Union* (1851); *Christ in the Soul* (1872).

UPHAM, Warren (1850–). An American geologist and librarian, born in Amherst, N. H. He graduated at Dartmouth in 1871, was employed on the Geological Survey of New Hampshire in 1875–78, on the Minnesota Geological Survey in 1879–85, and on the United States Geological Survey in 1885–95. In 1895 he became librarian of the Minnesota Historical Society, St. Paul. He wrote: *The Upper Beaches and Deltas of the Glacial Lake Agassiz* (1887); *The Glacial Lake Agassiz* (1895); *Greenland Icefields and Life in the North Atlantic, with a New Discussion of the Causes of the Ice Age* (1896), with G. F. Wright; *Minnesota in Three Centuries* (1908 et seq.). He compiled *Minnesota Biographies, 1655–1912* (1912), with Mrs. R. B. Dunlap.

UPHUES, o͞op′ho͞os, Goswin (1841–). A German philosophical scholar, born at Brochterbeck. Originally a Catholic theologian, he was suspended by the Church in 1876 for his attitude on the school question, and in the following year became gymnasium professor at Aarau. In 1890 he was appointed professor of philosophy at Halle. The psychology of perception was his special field of investigation. His writings include: *Reform des menschlichen Erkennens* (1874); *Kritik des Erkennens* (1876); *Psychologie des Erkennens* (1893); *Sokrates und Pestalozzi* (1896); *Schule und Leben* (1897); *Religiöse Vorträge* (1903); *Kant und seine Vorgänger* (1906); *Der geschichtliche Sokrates kein Sophist und kein Atheist* (1907); *Geschichte der Philosophie als Erkenntniskritik* (1909).

UPHUES, Joseph (1850–1911). A German sculptor, born at Sassenberg, Westphalia. He studied for three years at the Berlin Academy, and became a follower of Begas, whom he afterward assisted in his workshop. Much severer treatment of form, however, than is characteristic of Begas distinguishes his work, as may be seen in his "Sabine Defending his Sister," and the "Bowman" (great gold medal, Melbourne, 1888; Chicago, 1893), in the National Gallery at Sydney. For Düren in Rhenish Prussia he executed a monument to Emperor William I and the Bismarck Monument (1892); for Homburg and Wiesbaden (1896), monuments to Emperor Frederick; and in Berlin he created an entirely novel type of a youthful "Frederick the Great"; and contributed to the monuments in the Siegesallee the statue of Margrave Otto II. Three large sepulchral monuments of his design at Düren exhibit deep religious feeling and noble conception.

UP'JOHN, Richard (1802–78). An American architect, born in Shaftesbury, England. He emigrated to the United States in 1829, and in 1839 he settled in New York, where his best work was done. His principal works include: St. John's Church, Bangor, Me. (burned 1911); the Chapel of Bowdoin College; Christ Church and the Church of the Pilgrims, Brooklyn; Trinity Church and St. Thomas's (burned 1905) in New York; the Corn Exchange Bank, New York; and numerous private residences. From 1857 to 1876 he was president of the American Institute of Architects.

UPJOHN, Richard Michell (1828–1903). An American architect, son of Richard Upjohn. He designed the Central Church in Boston, with an exceptionally fine tower; the Park Congregational Church and the State Capitol at Hartford, Conn.; St. Paul's in Brooklyn; St. John's (American) Church at Dresden, Germany; and other churches in various cities.

UPLAND PLOVER. A sportsman's name for the large sandpiper (*Bartramia longicauda*) common throughout the United States, and frequenting uplands and plains more than is customary with other species of its kind. See SANDPIPER.

UPMARK, up′märk, GUSTAF HENRIK VILHELM (1844–1900). A Swedish art historian, born in Stockholm. After studying at Upsala (1861–69), he secured a position in the National Museum in Stockholm and was its director from 1880 to his death. He was the founder and chairman of the Gripsholms Society which, in 1889–95, restored the long-neglected ancient castle of the Vasa dynasty. Upmark's more important publications include: *De grafiska konsterna* (1889); *Svenska Riddarhuset, byggnadshistoria* (1890); *Architektur der Renaissance in Schweden 1530–1760* (Berlin, 1897–99); besides many essays concerning art in Sweden under the Vasa dynasty, such as *Tapetväfveriet i Sverige under de första Vasakonungarna* (1886), *Gripsholms slott* (1887), *Vadstena slott* (1891), *Skånska herrgårdar under renässanstiden* (1894), *Stockholms slott under Vasatiden* (1896).

UPOLU, o͞o-pō′lo͞o. The second largest and politically the most important island of Samoa (Map: Samoan Islands, C 5). Length, 39½ miles, average breadth from north to south, 8 miles; area with outlying islands, about 345 square miles. On the north shore there are harbors at Apia, Saluafata, and Fagaloa (of which Apia alone is a port of entry), all well protected against the southeast tradewind, but exposed to the frequent and heavy northerly gales in the rainy season. The backbone of the island is a fairly single mountain chain about 2500 feet in height. Plantations lie on the narrow coastal plain and gentle slopes of the central and western regions of the north shore. Apia, the seat of administration, is a small town lying along the beach but singularly healthful; the residence of the governor lies several miles inland at Vailima in the hills. Pop., 1910, 20,662, including with Upolu the islands of Manono and Apolima. See SAMOAN ISLANDS.

UPPER AMMONOOSUC. See AMMONOOSUC.

UPPER AUSTRIA, or AUSTRIA ABOVE THE ENNS. An archduchy and crownland, occupying the western part of the original Archduchy of Austria—the nucleus of the Austrian Empire (Map: Austria, D 2). Area, 4628 square miles.

Almost all the archduchy is either mountainous or rolling. The Danube divides the land into two very unequal parts. The northern and smaller is a prolongation of the Bohemian forests (the Böhmer Wald), while the southern belongs to the Alps (Kalkalpen) system, where high peaks, with glaciers on their slopes, lift their heads. The highest point in the archduchy is approximately 10,000 feet—the Dachstein, on the extreme southern border. In the mountainous southwestern portion is the famous Salzkammergut (q.v.), from which the Traun valley descends southeasterly to below Linz, through the heart of the archduchy. In the western portion is the Hausruck region, which produces lignite in abundance. The Enns, an affluent of the Danube, entering near the southeast corner of the archduchy, marks the eastern boundary. The Kammersee and Traunsee are the largest of its lakes. There are about 30 mineral springs, the best known being the saline waters at Ischl and the iodine waters at Hall. The climate yields an ample rainfall while the temperature depends on the altitude.

The crownland is highly productive. Considerably over one-third of the total area is tilled, over one-third is in forests, and nearly one-fifth meadows and pasture. Rye, barley, oats, wheat, vegetables, and fruit are the most prominent products. Cattle raising and horse raising are very important industries. Brown coal and salt are extensively mined, and there are valuable quarries of gypsum and stone. The salt industry is a government monopoly and about 30 per cent of the product of the Empire is supplied by Upper Austria. The crownland manufactures metal wares—weapons, knives, etc.—machinery, linens, cottons, paper, and cellulose.

The Landtag has 69 members, including the Bishop of Linz and representatives of large landed estates, cities, rural districts, and the chambers of industry and commerce in the capital, Linz, the leading town. To the Lower House of Austria the crownland sends 22 delegates, all German. Pop., 1900, 810,246; 1910, 853,006. Of the total in 1910, 97.31 per cent were Roman Catholic, 2.48 per cent Evangelical, and 0.14 per cent Jewish. German was the vernacular of 99.7 per cent.

UPPER COQUILLE, kō-kēl′. An ATHAPASCAN TRIBE.

UPPER SANDUSKY. A village and the county seat of Wyandot Co., Ohio, 64 miles north by west of Columbus; on the Sandusky River, and on the Pennsylvania and Hocking Valley railroads (Map: Ohio, D 4). It has an old mission church, a handsome court house, a Carnegie library, and a park. Upper Sandusky is engaged chiefly in manufacturing, the most important products being agricultural implements, hay presses, buggies, and other vehicles, caskets and burial cases, steam pumps, tools, cereal food, flour, brick and tile, and gasoline tractors. Pop., 1900, 3355; 1910, 3779.

UPPER SENEGAL AND NIGER. One of the colonies which constitute the Government-General of French West Africa. It extends approximately between 10° and 20° N. lat., bounded by Mauritania and Senegal on the west and the Military Territory of the Niger on the east. Its northern limits extend to the Algerian Sahara, and on the south it touches French Guinea, the Ivory Coast, the Gold Coast, Togo, and Dahomey (Map: Africa, D, E 3). The *Annuaire du gouvernement général de l'Afrique occidentale française* published in 1914 states that the area is about 2,500,000 square kilometers (sq. km. = 0.3861 sq. m.). This includes the Saharan regions occupied by nomads. The area having a sedentary population, which extends northward to about the seventeenth parallel, does not exceed 1,000,000 square kilometers. The country embraces the basins of the upper Senegal, the middle Niger, and the upper Volta. In general the surface is flat or rolling; the highest mountains, in the southwest, reach an altitude of 600 to 700 meters. A vast plateau of ferruginous laterite extends to about the fourteenth parallel, where it gives way to sandy plains which finally merge into true desert. The natives practice both agriculture and grazing. The principal crops include rice, corn, peanuts, millet, manioc, and tobacco. Some cotton is produced, and the natives manufacture cotton cloth. Large numbers of cattle, camels, horses, donkeys, and ostriches are raised. The forests yield rubber, gums, and valuable timber. Imports and exports by way of Senegal were valued at 9,803,799 and 3,422,410 francs in 1912. The principal exports in 1912 were peanuts, rubber, hard gums, and corozo nuts. In addition, there is a considerable trade by way of French Guinea, the Ivory Coast, the Sahara, etc. From the middle of June to the middle of November there is steamer communication on the Senegal River between Kayes and St. Louis on the coast. A railway extends from Kayes to Konlikoro, 553 kilometers; it reaches the Niger at Bamako, kilometer 496. The line has been in operation since 1904. At kilometer 10 there is a branch of 2 kilometers to Médine. Westerly from Kayes a railway extends to Ambidedi, 44 kilometers.

The native population is estimated at somewhat over 5,600,000, of whom about 5,598,000 are French subjects. The white inhabitants number about 1100, almost entirely French. Of the natives who are French subjects, the number of Mohammedans is stated at about 1,405,000, and of fetishists at about 4,191,000; there are a few Roman Catholic natives, probably less than 2000. The capital is Bamako, the population of which is about 7050; other important towns are Ouagadougou, 19,332; Kayes, 8952; Ségou, 8405; Sikasso, 7408; Timbuctoo, 6699. The colony is administered by a Lieutenant-Governor, under the Governor-General of French West Africa.

UPPER TUNGUSKA, tụn-gōō'skȧ. See Angara.

UPSALA, ụp-sä'lȧ. The capital of the Län of Upsala, Sweden, on both banks of the navigable Fyriså, in a fertile and historic plain, 41 miles by rail north-northwest of Stockholm (Map: Sweden, F 7). The ancient city is best known now for its university. (See Upsala, University of.) The new town lies on a level on the left bank of the river; the old portion ascends the hills on the west shore. The fine French-Gothic cathedral dates from 1258 and was completely restored between 1870 and 1893. The interior contains the splendid burial chapel of Gustavus Vasa. The cathedral also contains a monument to the botanist Linnæus, who lived in Upsala.

Among the university buildings in the vicinity of the cathedral are the ancient Gustavianum, the Carolina Rediviva (1841), and the handsome new Renaissance structure completed in 1886. The valuable university library is celebrated for the Codex Argenteus of Ulfilas (q.v.). The botanic garden is very fine. The half-finished historic castle—the Slott—on the hill to the south of the town was built by Gustavus Vasa in 1548 and is now used for the provincial archives. Southeast and stretching along the Fyriså is the Strömparterre—a pleasure park called by the students the "hole of a beehive." South of the city is the noteworthy Ultuna Agricultural Institute. Several miles farther south is the splendid château of Skokloster. Its origin is due to Marshal Wrangel, who housed here his rich collections accumulated in Germany in the Thirty Years' War. Northeast of Upsala lies the notable village of Gamla Upsala, the capital of the ancient pagan kings, who worshiped here in a celebrated temple. Adjacent are tumuli (about 60 feet high) which were connected with the pagan rites. In the vicinity is the *Tingshög*—a hill (32 feet high) from which the ancient rulers spoke to the people. The name Upsala (OSwed. *Uppsalir*, the high halls) dates from 1273, when the Archbishop took residence there.

Upsala has an excellent school system, comprising both normal and high schools, a fine hospital, an insane asylum, a royal society of science, a medical association, and an organization for the study of the humanities. The Museum of Northern Antiquities is in the garden of Linnæus. Upsala was formerly an important commercial centre, but now the town owes its prosperity mainly to the university. Pop., 1900, 22,855; 1910, 25,960.

UPSALA, University of. An institution of learning situated at Upsala, Sweden. In 1477 Pope Sixtus IV gave permission to establish a Studium Generale at Upsala after the model of Bologna and lectures were begun the same year. In 1566 Eric XIV established a chair of Greek. King John III established four new professorships, but as the professors refused to assent to the King's Catholicizing acts, the university was closed. It was not until 1593, when the Reformation again gained a strong foothold in Sweden, that the university was reëstablished, with two faculties, theological and philosophical. Gustavus Adolphus endowed the university munificently, thus assuring its material independence. The Gustavianum, one of the oldest buildings, dating from the reign of this monarch, is still extant. The university consisted of the faculties of theology, law, medicine, and philosophy. The attendance in 1913 was 2419. The library, which was enriched considerably by the collections of Gustavus Adolphus, contains over 400,000 volumes and 22,000 pamphlets. Consult C. Annerstedt, *Upsala Universitets Historia* (Upsala, 1877–1914), and C. F. Thwing, *Universities of the World* (New York, 1911).

UPSHUR, ŭp'shẽr, Abel Parker (1790–1844). An American statesman, born in Northampton Co., Va. He studied law under William Wirt (q.v.), and was in 1810 admitted to the bar. In 1824 he was elected to the State Legislature, in 1826 was appointed a judge of the Virginia General Court, and in 1829 was made a member of the convention for the revision of the State constitution. President Tyler appointed him Secretary of the Navy in 1841, and in 1843 he was transferred to the post of Secretary of State, left vacant by the resignation of Daniel Webster. He was an extreme supporter of States' rights and slavery. His death was caused by the bursting of a gun on board U.S.S. *Princeton*. He published an *Inquiry into the Nature and Character of our Federal Government* (1840).

UP'SON, Anson Judd (1823–1902). An American clergyman and educator, born in Philadelphia. He graduated at Hamilton College in 1843. In 1849 he was appointed professor of rhetoric and moral philosophy at Hamilton, and from 1853 to 1870 was professor of logic and rhetoric there. He then became pastor of the Second Presbyterian Church in Albany. He was appointed professor of sacred rhetoric and pastoral theology at Auburn Seminary in 1880, and in 1887 became professor emeritus. In 1890 he was made chancellor of the University of the State of New York.

UP'TON, Emory (1839–81). An American soldier, born at Batavia, N. Y. He graduated at West Point in 1861; served as aid-de-camp on the staff of General Tyler, and while so doing was wounded in the battle of Bull Run; fought in the Peninsular campaign and in the Maryland campaign; and was commissioned colonel of the One Hundred Twenty-first New York Volunteers on Oct. 23, 1862. He was engaged in the battle of Fredericksburg; commanded a brigade of the Sixth Corps at Gettysburg, Rappahannock Station, and Mine Run, and in the Wilderness campaign and part of the Richmond campaign. At Spottsylvania in May, 1864, he was wounded while leading the assaulting column of 12 regiments of the Sixth Corps, and as a reward for his gallantry was brevetted lieutenant colonel of the Twenty-fifth Infantry from 1866. He was wounded at Opequan in the Shenandoah campaign, and for gallant conduct at Winchester was brevetted major general of volunteers. He later commanded the Fourth Cavalry Division in Gen. J. H. Wilson's operations in Georgia, and for his services in the assault on Selma was brevetted brigadier general in the regular army. After the war he served as lieutenant colonel of the Twenty-fifth Infantry from 1868 until 1880, when he became colonel of the Fourth Artillery. He was also engaged in preparing a system of tactics for the service, and from 1870 until 1875 was commandant of cadets at the Military Academy at West Point. Not long after his promotion to the rank of colonel his mind became affected and he committed suicide. His published works include: *A New System of Infantry Tactics* (1867; 2d ed., 1874); *Tactics for Non-Military Bodies* (1870); and *The Armies of Asia and Europe* (1878). Consult Michie, *Life and Letters of Major-General Emory Upton* (New York, 1885).

UPTON, GEORGE PUTNAM (1835–). An American musical critic, born in Boston, and educated at Brown University. From 1863 to 1881 he was on the editorial staff of the Chicago *Tribune*. In 1872 he founded and became first president of the Apollo Club. His works include: *Woman in Music* (1885); *Standard Operas* (1886; 15th ed., 1912); *Standard Oratorios* (1887); *Standard Symphonies* (1892); *Johann Sebastian Bach* (2 vols. in 1, Chicago, 1905); *Standard Concert Repertory* (1909). He also translated Nohl's biographies of Haydn, Beethoven, Wagner, and Liszt.

UR, ẽr (Heb. *'ûr*, Bab. *Uru*). An ancient city in southern Babylonia, which has been identified with the modern Mukayyar. The site lies close to the Euphrates, at the point where the canal Shatt el Hai connects this river with the Tigris, while the Wadi Rummein gives it access to Arabia. Hence, it was in a favorable position for the development of commerce and political greatness. It was the chief seat in Babylonia of the worship of the moon god Nannar or Sin, whose massive temple still stands 70 feet above the plain. The city was held by Eannatum of Lagash, Lugalkigubnidudu and Lugalzaggisi of Erech, and it became the capital of the Kingdom of Sumer and Akkad, founded by Ur Eugur c.2574 B.C. Dungi, Bursin, Gimilsin, and Ibesin reigned there. From this period we have a number of important inscriptions. In the reign of Hammurapi (2124–2081 B.C.) of Babylon, Ur was conquered by the Amoritish dynasty. It remained important as a sacred place. In the Assyrian period it was ruled by a governor. Bilsharusur, the son of Nabunaid, was Governor of Ur. The population of the city was originally Sumerian. An admixture of Akkadians must be assumed for the period of Ur Eugur and his successors. Later it is probable that Chaldæans (q.v.) settled in Ur. The biblical passages call it Ur of the Chaldees, and make it the starting point of the migration of Abraham's family westward (Gen. xi. 27–32). The first examination of the ruins in modern times was by Pietro della Valle in 1625, who brought home a number of cuneiform inscriptions from Mukayyar. In 1854 and 1855 J. E. Taylor examined the ruins, described the remains, identified the temple of the moon god, and sent to London a number of important inscriptions. Consult: J. E. Taylor, in *Journal of the Royal Asiatic Society*, vol. xv (London, 1855); Loftus, *Travels and Researches in Chaldea* (ib., 1857); H. V. Hilprecht, *Explorations in Bible Lands* (Philadelphia, 1903); R. Zehnpfund, *Babylonien in seinen wichtigsten Ruinen-stätten* (Leipzig, 1910); L. W. King, *A History of Sumer and Akkad* (New York, 1910). See BABYLONIA, *History*.

URABÁ, ōō′rȧ-bä′, GULF OF. The former name for the Gulf of Darien and now applied to the southern portion. See DARIEN.

URÆMIA, û-rē′mĭ-ȧ (Neo-Lat., from Gk. *οὖρον, ouron*, urine + *αἷμα, haima*, blood). The term applied to a characteristic group of symptoms arising from the retention in the circulation of systemic poisons which normally are excreted by the kidneys. (See BRIGHT'S DISEASE.) The symptoms of uræmia are manifested principally in the cerebrospinal nervous system and consist of headache, nausea, vertigo, diminished vision and drowsiness, followed, in severe cases, by convulsions and coma. The urine is scanty, contains casts, and is deficient in urea. Uræmia is a very fatal complication of nephritis. Treatment is addressed to relieving the kidneys of their burden by stimulating the eliminative action of the bowels and skin. Elaterium and the saline purges, hot baths and packs are useful. The kidneys may be stimulated to greater activity by cupping over the loins, and the administration of hot enemas and diuretic drugs. A milk diet is indicated.

URAGA, ōō′rä′gȧ. A village in the Province of Sagami, Japan, 15 miles south-southeast of Yokohama. It lies in two divisions on both sides of a narrow harbor. There are two large dry docks. The views in the vicinity are beautiful. Commodore Perry's fleet dropped anchor here on July 8, 1853, and at Kurihama, near by, on July 14, he met the representatives of the Shogun and delivered President Fillmore's letter. This was the first of the series of events which resulted in the opening again of Japan to foreign intercourse. In 1900 a plot of land was purchased at Kurihama and named Perry's Park, and a monument in his honor was unveiled July 14, 1901. Pop., about 1600.

URAL, ū′ral, *Russ. pron.* ụ-räl′y'. A river of east Russia, partly on the boundary between Europe and Asia (Map: Russia, J 4). It rises in the southern Ural Mountains in the Government of Orenburg, and flows first south through one of the eastern longitudinal valleys, then westward around the southern spurs of the mountain system, and finally southward, emptying into the northern extremity of the Caspian Sea after a course of about 1400 miles. The rainfall over its widely extended basin is but slight, so that the river receives no important tributaries and is unnavigable. The chief towns on its banks are Orsk, Orenburg, Uralsk, and Guriev, the last named at its mouth.

U′RAL-ALTA′IC. The term commonly employed by anthropologists to designate a branch of the yellow or Asian race, which includes the following groups: Tungusic (Tunguses, Manchus, etc.), Mongolic (Mongols, Kalmucks, etc.), Tataric (Turks, Tatars, part of the Cossacks, Kirghizes, etc.), Finnic (Samoyeds, Finns, Lapps, Magyars, etc.), Arctic (Tchuktchis, Koriaks, Kamchatkans, Giliaks, Ainus), and Japanese-Korean. The civilized and more or less Aryanized Finns and Magyars of Europe, the latter intruding Osmanli Turks of Asia Minor, southwestern Europe, and northern Africa, the civilized Turko-Tatar states, ancient and modern, of Turkestan and adjacent parts of central Asia, the Mongol conquerors of China and India, the Asiatic elements of Korean-Japanese culture, etc., represent the capacities, independent and stimulated by contact with other races and peoples, of the Ural-Altaic tribes. While the location of the earliest home of the Ural-Altaic peoples is still indeterminable with exactness—it was somewhere between the Ural and the Altai—certain centres of dispersion of its subdivisions can be noted: Mongolia south of the Altai, Turkestan north of the Pamir, the Uralian country, the Baikal region, the Amur valley, etc. The variety of the response of the Ural-Altaic peoples to foreign culture is seen in their religions. The uncivilized tribes are mostly devotees of Shamanism, as of old, but the Mongols, Manchus, Buriats, Kirghiz-Kalmuck Tatars, and to some extent Koreans and Japanese are Buddhist, the Bashkirs, Turks, etc., are Mohammedans, the greater part of the Kamchatkans, Tchuvashes, part of the Yakuts and of some other Siberian tribes, are Christians of the Russian (Greek) church, the Magyars are about three-fifths Catholic and two-fifths Protestant, and the Finns for the most part Lutheran. Consult: Castrén, *Ethnologische Vorlesungen über die altaischen Völker* (St. Petersburg, 1857); Schott, *Altaische Studien* (Berlin, 1860–72); Mistelli, *Der altaische Sprachtypus* (Basel, 1883); A. H. Keane, *Man, Past and Present* (London, 1900). See Ural-Altaic Languages.

URAL-ALTAIC LANGUAGES (Ural and Altai mountains); also called Finno-Tataric, Scythian, or Turanian. A vast group of languages spoken over a territory extending from Okhotsk in the east to Finland, Hungary, and Turkey in the west, and from the Mediterranean to the Arctic Ocean. This group is subdivided into a number of branches, all more or less distantly related, of which the main characteristics are agglutinative terminations that may be appended to an unchangeable root, and possessive pronouns that may be affixed to the noun. A law peculiar to this group of languages is that known as vowel harmony, a species of umlaut (q.v.), or progressive vowel assimilation, by which the vowel of the changeable suffix is adapted more or less accurately to the vowel of the stem, or root. Thus, in Turkish, *yaz*, write, is in the infinitive *yazmak*, to write; while *sev*, love, is *sevmek*, to love. The main branches of the Ural-Altaic group of languages are the following: (*a*) The Finno-Ugric, also known as the Finnic or Ugrian, comprising (1) the Finnic, whose main subdivisions are the Finnish (q.v.), the Tchudic about Lake Onega, the Karelian (see Karelians) from the White Sea to Lake Ladóga, the Livonian (now almost extinct; see Livonia) and the Crevinian in Courland (q.v.), the Esthonian (see Esthonia) to the south of the Gulf of Finland, and the Lapponic of Lapland (q.v.); (2) the Permian spoken about the Ural Mountains in the northeastern part of European Russia; (3) the Volga-Finnic or Bulgaric, comprising the Tcheremissian spoken between Nizhni Novgorod (q.v.) and Kazan (q.v.), and Mordvinian on the Middle Volga; (4) the Ugric comprising the Vogul about the Obi River, and the Magyar or Hungarian (q.v.) spoken in central and western Hungary and in Transylvania. (*b*) The Samoyedic (see Samoyeds) branch consisting of a number of dialects along the White Sea and the Arctic shore of Siberia. (*c*) The Tunguse including the dialects spoken by the Tunguses between the Yenisei River and the Sea of Okhotsk in Siberia and by the Manchus (q.v.) of Manchuria. (*d*) The Mongolian branch consisting of Mongolian proper in the north of China (see Mongolia, *Language*), the Buriat dialects (see Buriats) on the shore of Lake Baikal, and the Kalmuck (see Kalmucks) or western Mongolia extending as far west as the Caspian Sea. (*e*) The Turko-Tataric branch comprising the Yakut spoken on the banks of the Lena River in Siberia, the Kirghiz (q.v.) from Turkestan to the north of the Caspian, and Lake Balkash, the Nogair of the Russian Cossacks in Crimea, the Uiguric and Turkoman (q.v.) in Turkestan, and Turkish (q.v.).

Bibliography. Henry Sweet, *History of Language* (London, 1900); W. D. Whitney, *Languages and the Study of Language* (6th ed., New York, 1901); id., *Life and Growth of Language* (new ed., ib., 1902); T. G. Tucker, *Introduction to the Natural History of Language* (London, 1908); Leonard Bloomfield, *Introduction to the Study of Language* (New York, 1914); also: Vambéry, *Uigurische Sprach-Monumente und das Kudatkü Bilik* (Innsbrück, 1870); W. Thomsen, *Ueber den Einfluss der germanischen Sprachen auf die Finnisch-Lappischen* (Ger. trans. by Sievers, Halle, 1870); L. Adam, *Grammaire de la langue mandchoue* (Paris, 1872); id., *Grammaire de la langue tongouse* (ib., 1874); Donner, *Vergleichendes Wörterbuch der finnisch-ugrischen Sprachen* (3 vols., Helsingfors, 1874–88); N. Anderson, *Studien zur Vergleichung der indogermanischen und finno-ugrischen Sprachen* (Dorpat, 1879); H. Winkler, *Uralaltaische Völker und Sprachen* (Berlin, 1884); id., *Das uralaltaische und seine Gruppen* (ib., 1885); Radloff, *Versuch eines Wörterbuchs der Türk-Dialekte* (St. Petersburg, 1888); id., *Die alttürkischen Inschriften der Mongolei* (ib., 1894); Grunzel, *Entwurf einer vergleichenden Grammatik der altäischen Sprachen* (Leipzig, 1895); and the *Mémoires de la société finno-ougrienne* (Helsingfors), which have been published annually since 1883.

U′RALITE. A variety of amphibole derived from pyroxene. Its crystals, when distinct, show the form of the original mineral, but have the cleavage of amphibole. The crystals vary in color from pale to deep green, and are found at various localities, as in the Ural Mountains and at Canaan, Conn.

URAL (ū′ral, *Russ. pron.* ụ-räl′y′) **MOUNTAINS.** A mountain range in Russia, forming part of the conventional boundary between Europe and Asia. It extends in a general north and south direction approximately along the sixtieth meridian of east longitude from the Kara Sea to the north bank of the Ural River (Map: Russia, K 1). A northwestern extension reappears in the Arctic seas to form the main range of the islands of Waigatz and Nova Zembla, while a southern extension, known as the Mugodzhar Mountains, runs south of the Ural River nearly to the shores of the Sea of Aral. The Ural Mountains do not form a single range, but constitute rather a broad plateau 45 miles wide in the north and nearly 200 miles wide in the south. This plateau is broken up partly into a number of separate ridges or chains running in various directions, partly into broad dome-shaped masses, though the southern portion divides itself into several parallel north and south branches. The slope is gradual and on the road from Perm to the east it is scarcely perceptible, the steepest gradient on the Trans-Siberian being only 1 in 100. The average elevation of the main crests is not great, scarcely more than 1500 feet. Mount Tel-pos is 5433 feet above the sea and many peaks rise above 5000 feet. The climate is rather severe, with very cold winters and hot summers. The rainfall is greater on the western slope and in the central and northern portion than in the east and south. In spite of the northern location the Urals have no glaciers as the snowfall is slight. The range is a watershed of the Obi in the east, the Ural in the south, and the Volga and Petchora on the west. The vegetation in the southern portion consists mainly of steppes with isolated oases of trees. The central portion is covered with immense forests of spruce, larch, and firs, which in the north give place to dwarf birch and mossy tundras. Geologically, the range consists of a central longitudinal zone of metamorphic slates, granites, gneisses, and syenites, flanked on either side by sedimentary strata, which are chiefly Carboniferous and Permian in the western, and Cretaceous and Jurassic in the eastern zone. In the southeast there are large Devonian outcrops and intrusions of quartz and porphyry. The Ural Mountains are extremely rich in minerals, which are chiefly confined to the central division, between the 55th and 60th parallels, the northern parts being barren. There are rich deposits of iron ore—magnetite, limonite, and red hematite. Over 800,000 tons of pig iron were produced in 1912, the vast forests yielding an inexhaustible supply of fuel. Gold is mined both from veins and placers, and other rare metals, platinum, iridium, and osmium, are comparatively abundant. The Urals yield 90 per cent (5774 kilograms in 1911) of all the platinum produced in the world. Precious stones are also mined, as well as copper, silver, mercury, cobalt, nickel, and zinc. Coal beds exist on the west slope, and yielded in 1912 850,000 tons. Asbestos is one of the distinctive mineral products of the mountains. This mineral wealth has given rise to important industries, and a large number of populous towns have sprung up among the mountains, while a considerable agricultural population has also been attracted.

Consult: Ludwig, *Ueberblick der geologischen Beobachtungen* (Leipzig, 1862); Hochstetter, *Ueber den Ural im Ural* (Berlin, 1873); Hiekisch, *Das System des Urals* (Dorpat, 1882).

URALSK, o͞o-räl′y'sk. A province of Russia, lying mostly east of the Ural River, the boundary line between Europe and Asia (Map: Asia, G 4). Area, over 139,168 square miles. The surface generally presents a series of dry steppes and deserts sloping gradually to the Caspian. Part of the interior lies below the level of the Caspian. There are many salt lakes, and only the Ural (q.v.) and the Emba (during a part of the year) reach the Caspian, the other streams being lost in the lakes or in the sand. Uralsk is scantily watered. The climate is continental, the influence of the Caspian Sea being confined to the coast region. The temperature is subject to wide fluctuations, and the precipitation is slight. In the winter the snowstorms are very destructive. Uralsk contains little cultivable land, and agriculture is of secondary importance, the chief occupations being stock raising and fishing. The fisheries along the Ural and the coast of the Caspian Sea are among the most extensive and the best regulated in Russia. The value of the fish, caviar, fish oil, and other fish products exported exceeds $1,500,000. Pop., 1913, 849,800, two-thirds being Kirghizes. Capital, Uralsk.

URALSK. The capital of the Province of Uralsk, in southeast Russia, at the confluence of the Ural with the Tchagan, 980 miles southeast of Moscow (Map: Russia, H 4). It is a well laid out town with an industrial school for Kirghizes and a natural history museum. It is the commercial centre of the province. Pop., 1911, 45,605.

URAN, o͞o′*ran*. Indian linguistic stock of Bolivia and Peru once disseminated over the region from the shores of Lake Titicaca to Lake Poopo (or Aullagas) and the island of Panza, along the whole course of the Río Desaguadero. Consult J. T. Polo, in *Boletín de la Sociedad Geográfica de Lima*, vol. x (Lima, 1901), and A. F. Chamberlain, in *American Anthropologist*, new series, vol. xii (Lancaster, Pa., 1910).

URA′NIA (Lat., from Gk. *Οὐρανία*, *Ourania*, the Heavenly One, from *οὐρανός*, *ouranos*, heaven, sky). One of the Muses (q.v.). In the later division of functions among the Muses she became the guardian of Astronomy, or rather of the astronomical epic, such as was written by Aratus. She seems to be indicated in the groups of Muses by the globe.

U′RANIN. See COAL-TAR COLORS.

URAN′INITE. A mineral uranium oxide usually found in the form of botryoidal or compact masses and often containing such impurities as silica and the oxides of iron, lead, calcium, and magnesium. It is opaque, grayish, greenish, or brownish-black in color, its resemblance to pitch giving rise to the common term pitchblende, which is frequently applied to it. Uraninite has a submetallic lustre, and a conchoidal fracture. It occurs often with ores of silver and lead, in Bohemia, Saxony, Hungary, Turkey, etc. Uraninite, together with its decomposition products gummite and uranophane are important sources of the radium salts. See also RADIUM; POLONIUM; RADIOACTIVITY.

URA′NIUM (Neo-Lat., named after the planet Uranus). A metallic element discovered by Klaproth in 1789 and first isolated in the metallic state by Péligot in 1840. It is found chiefly as an oxide in the mineral uraninite or pitchblende, which occurs at various localities in Norway, Saxony, Cornwall, and the United States, and also in various other minerals, but in smaller quantities. An important source of uranium compounds in recent years is the uranochre from Cornwall, England. The metal itself may be obtained by reducing uranoso-uranic oxide (see below) with pure carbon or with powdered metallic aluminium, or by electrolyzing the fused double chloride of uranium and sodium.

Uranium (symbol, U; atomic weight, 238.5) is a hard, silvery-white metal with a specific gravity of 18.68. It melts at a bright-red heat.

It combines with oxygen to form a dioxide and a trioxide, which unite with bases to form uranous and uranic salts. Besides the dioxide (UO_2) and the trioxide (UO_3), it forms three other well-defined oxides: viz., the uranoso-uranic oxide (U_3O_8) already mentioned, a pentoxide (U_2O_5), and a peroxide (UO_4). Perhaps the most important of the uranium salts is sodium uranate, known as uranium yellow, used for painting on glass and porcelain, as well as in making the fluorescent yellow uranium glass. The uranoso-uranic oxide is used sometimes to produce a black glaze on porcelain.

Uranium and its compounds are radioactive, the element undergoing slow disintegration with formation of a new and distinct element (likewise radioactive) known as uranium X, having an atomic weight probably of 230.5, and behaving chemically like the element thorium. See RADIOACTIVITY.

URANIUM RAYS. See RADIOACTIVITY.

URAN'OLITE. See METEORITE.

U'RANOPLAS'TY. See PALATE.

U'RANUS (Lat., from Gk. *Οὐρανός*, *Ouranos*, heavens, sky). In Greek theogony, the husband of Gæa, the Earth, and, according to Hesiod, father of the Titans, Cyclopes, and Hecatoncheires. Legend represented him as dethroned and mutilated by his son Cronos. (See SATURN.) From his blood, which fell upon the earth, sprang the Gigantes (see GIANTS), while the part which fell into the sea was washed about until from the foam which gathered rose Aphrodite. Uranus was never an object of worship, but rather, like Cronos, a conception formed from the cult of Zeus for the purpose of a constructive theogony. Among the Romans Cælus appears in myth as a translation of the Greek name, but not as a deity of the Roman religion.

URANUS. The next to the outermost member of the solar system. Its mean distance from the sun is 1,782,000,000 miles; sidereal period, 84 years; eccentricity not quite $\frac{1}{20}$, or about the same as that of Jupiter; inclination to the ecliptic, 46'. It is about 66 times greater than the earth in volume and 15 times in mass, and its density and surface gravity respectively are 0.22 and 0.9. In the telescope the planet appears as a greenish disk of about 4" diameter. The greenish tinge is explained as due to some unidentified substance in the planet's atmosphere. Because of its immense distance, astronomers have been unable to gain much information concerning it. Spots and belts have been seen, but they are too faint to warrant any positive assertion, and the time of rotation of the planet is not known with certainty, though it is probably about 10 hours. Uranus was accidentally discovered by Sir William Herschel on March 13, 1781, and was named the Georgium Sidus and Herschel, but these names soon fell into disuse and the name of Uranus, suggested by Bode, finally prevailed. Herschel announced the discovery as that of a comet, and its planetary nature was not demonstrated until three or four months later by Lexell, of St. Petersburg. Before its detection by Herschel, Uranus had been recorded no less than 20 times as a fixed star, 12 times by Lemonnier alone. These observations when compared with more recent ones showed that the planet was wandering from its track. The attempts made to account for these irregularities led to the discovery of Neptune (q.v.).

Uranus has four satellites:

NAME	Distance from planet in miles	Sidereal period
Ariel	120,000	2d 12h 29m
Umbriel	170,000	4d 3h 27m
Titania	280,000	8d 16h 57m
Oberon	375,000	13d 11h 7m

Oberon and Titania were discovered by the elder Herschel, Jan. 11, 1787; the other two were discovered by Lassell, Oct. 24, 1851. They are estimated to vary in size from 200 to 500 miles in diameter. The plane of their orbits is inclined at 98° to the plane of the ecliptic, and the direction of their motion, like that of Phœbe, the ninth satellite of Saturn, the eighth and ninth satellites of Jupiter, and the satellite of Neptune, is from east to west. See ASTRONOMY; PLANETS; SOLAR SYSTEM.

URARI. See CURARI.

URASHIMA TARO, o͞o'rȧ-shē'mȧ tä'rō. In Japanese legend, the story of a fisher boy who was taken down on the back of a tortoise into the palace of *Ryu-gū*, or the realm of the dragon king of the world under the sea, and there in blissful dalliance knew nothing of the flight of time. Returning to the earth for a brief visit to his parents, he finds all strange in his native village, enters the old cemetery, and, against the express orders of the sea king's daughter, opens the casket she has given him, only to find himself an old man soon to die. This is a favorite theme with native artists. The legend is one of the oldest in the language, and is first found in writing in the *Mannyōshū* (Collection of a Myriad Leaves of Poetry) of the seventh and eighth centuries. The official annals give 477 and 825 A.D. as the dates of his disappearance and return. The myth of Urashima is the Japanese version of the Oriental legend of the Seven Sleepers, represented in America by the story of Rip Van Winkle, and also found in Celtic mythology.

URATYUBE, o͞o'rȧ-tyo͞o'be. A town in the Territory of Samarkand, Russian Turkestan, 55 miles southwest of Khodjend (Map: Asia, Central, N 3). It is surrounded by a wall and has a Russian quarter. The chief articles of trade are horses and camel-wool cloth. Pop., about 22,000, chiefly Uzbegs. Uratyube was founded, according to local tradition, by Cyrus. It was taken by the Russians in 1866.

URBAIN, ụr'bäN', GEORGES (1872-). A French chemist, born in Paris. He obtained the degree of D.Sc. from the Faculty of Sciences, Paris, in 1899, and later became professor of chemistry at the Sorbonne. His writings include: *Recherches sur la séparation des terres rares* (1899), and *Introduction à l'étude de la spectrochimie* (1911).

UR'BAN. The name of eight popes.—URBAN I, SAINT, Pope 222-230. His pontificate, coming under the reign of the Emperor Alexander Severus, was little disturbed by external persecution. The schismatic movement fostered by the self-willed rigorist Hippolytus still continued; but Urban, like his predecessor Calixtus (or Callistus) I, set himself firmly against it.—URBAN II, Pope 1088-99, originally Otho by name. He was Archdeacon of Auxerre, and then entered the monastery of Cluny, where he became prior. In 1078 Gregory VII called him to Rome and made him Bishop of Ostia. During almost his entire pontificate, his position was endangered by the presence in Rome of the powerful antipope, Guibert of Ravenna, called Clement III. Urban carried on the policies of his predecessor, Gregory VII, vigorously prosecuting the struggle with Henry IV, and attacking such evils as simony, lay investiture, and clerical marriage. In 1094 he excommunicated Philip I of France for his matrimonial infidelity. He presided at the famous Council of Clermont in 1095, which gave the impulse to the Crusades. On this occasion he himself preached a famous sermon in favor of the Crusade. In 1098 a council was held at Bari, at which many Greek bishops were present, and in which the addition of the word *filioque* to the creed was discussed. He died at the close of 1099, just at the time when the First Crusade, which he had organized, terminated in the successful occupation of Jerusalem.—URBAN III, Pope 1185–87, Uberto Crivelli. Before his elevation to the papacy he was Archbishop of Milan. His quarrels with the Roman Senate compelled him to spend his pontificate in exile. He was an opponent of Frederick Barbarossa. The Emperor besieged the Pope in Verona, but was recalled to Germany by tidings of revolt there, and Urban was on the point of excommunicating him when he died near Ferrara. Consult J. Langen, *Geschichte der römischen Kirche von Gregor VII. bis Innocenz III.* (Bonn, 1893).

URBAN IV, Pope 1261–64, Jacques Pantaléon. He was the son of a shoemaker of Troyes, and rose by his talents and virtues to high positions in the Church, becoming titular Patriarch of Jerusalem in 1255. He was elected Pope at Viterbo, and spent the whole of his pontificate there and at Orvieto, being excluded from Rome by the power of Manfred, natural son of the Emperor Frederick II, against whom he incited Charles of Anjou to take up arms. He preserved a strict neutrality between the rival candidates for the Empire, and in the difficulties between Henry III of England and his barons took the side of the King. The nomination of numerous French cardinals led to the preponderance of that party, and so ultimately to the great schism. Consult Dorez and Guiraud, *Les régistres d'Urbain IV* (Paris, 1892), and a biography by Georges (ib., 1865).

URBAN V, Pope 1362–70, Guillaume de Grimoard. The cardinals could not agree upon one of their own number, and therefore elected him, then abbot of Saint-Victor at Marseilles. This was at the time of the papal residence at Avignon. In 1367 he resolved to return to Rome, but finding the papal city in a condition all but ruinous, and having endeavored with little success to repress the disorder of the times, he returned to Avignon in 1370. Here he died less than a month after his return, leaving the reputation of great personal piety and zeal for the interests of religion. Consult: Magnan, *Histoire d'Urbain V* (2d ed., Paris, 1863); Kirsch, *Die Ruckkehr der Päpste Urban V und Gregor XI von Avignon nach Rom* (Paderborn, 1898); Ludwig Pastor, *History of the Popes*, vol. i (3d ed., London, 1906).

URBAN VI, Pope 1378–89, Bartolommeo Prignano. At the time of his election he was Archbishop of Bari. On the death of Gregory XI, who had brought back the seat of the papacy from Avignon to Rome, Prignano was elected in a conclave held under circumstances of great excitement, owing to the apprehension on the part of the populace of an intention to elect a French pope and again abandon Rome. The most important aspect of his pontificate is that relating to the Great Schism (see SCHISM, WESTERN), which arose out of the conflicting claims to the election. While the candidate of the French cardinals took up his residence at Avignon, under the name of Clement VII, Urban occupied the papal seat in Rome. After a dispute with Charles, King of Naples, whom he had himself crowned, he died of a fall from his mule, though there were the usual suspicions of poison. Consult Ludwig Pastor, *History of the Popes*, vol. i (3d ed., London, 1906).

URBAN VII, Pope 1590, Giovanni Castagna. He had been a member of the Council of Trent in its last period, and then for several years Nuncio in Spain. Elected to succeed Sixtus V, he died 12 days later, before he could be consecrated.

URBAN VIII, Pope 1623–44, Maffeo Barberini. He was born in Florence, 1568, educated at Rome and Pisa, and destined for an ecclesiastical career. After serving twice as Nuncio to France, he was made Cardinal in 1606. Urban VIII was guilty of nepotism; but his administration was, on the whole, vigorous and enlightened. He was the founder of the celebrated College of the Propaganda, and to him Rome is indebted for many public works. Some of the early stages of the Jansenist controversy (see JANSENISM) fall within his pontificate. In the Thirty Years' War he sided with France against the Emperor and Spain. In his pontificate the Duchy of Urbino was annexed to the papal dominions.

URBAN, ṳr′bàn, JOSEF (?–   ). An Austrian designer of stage settings. He was born in Vienna, where he was architect of many dwellings. In 1904 he was sent by Austria to arrange the exhibit of that country in the Fine Arts Building at the St. Louis Exposition, and he had similar commissions in the large cities of Europe. For several years he was chief artistic adviser of the Imperial Opera House in Vienna, and later was secured by Henry Russell to paint scenery for the Boston Opera Company. Subsequently he did much work in New York. His settings, characterized by originality, beauty, and imaginative power, include those made for *The Jewels of the Madonna*, *The Love of Three Kings*, *The Garden of Paradise*, James K. Hackett's productions of *Macbeth* and *The Merry Wives of Windsor*, and Percy MacKaye's Shakespeare Masque (1916).

URBAN′A. A city and the county seat of Champaign Co., Ill., 128 miles south by west of Chicago, on the Cleveland, Cincinnati, Chicago, and St. Louis, the Wabash, and the Illinois Traction railroads (Map: Illinois, H 5). It is the seat of the University of Illinois (q.v.), opened in 1868. There are the public library, the Champaign County Teachers' and Pupils' Library, and the Illinois State Laboratory and Natural History Library. The most prominent buildings are the Cunningham Deaconess Home, County Court House, high school, post office, jail, Municipal Building, and the Masonic Temple. Besides Crystal Lake Park there are two others aggregating 40 acres. Urbana is the centre of a rich farming district, and manufactures brick and tile, lawn mowers, and iron novelties. The Cleveland, Cincinnati, Chicago, and St. Louis Railroad maintains extensive shops here. Pop., 1900, 5728; 1910, 8245; 1915 (U. S. est.), 9632.

URBANA. A city and the county seat of Champaign Co., Ohio, 47 miles west of Columbus, on the Erie, the Cleveland, Cincinnati, Chicago, and St. Louis, the Pittsburgh, Cincinnati, Chicago, and St. Louis, and the Ohio Electric railroads (Map: Ohio, C 5). It is the seat of Urbana University (Swedenborgian) and of the Curry School (for negroes) and has a public library. Urbana is surrounded by a productive farming region and is of considerable industrial importance. Furniture, brooms, paper, oil cans, egg cases, tools, woolens, and strawboard are the leading manufactures. Urbana was laid out in 1805, and for a time in 1812 was the headquarters of the Northwestern army. It is the burial-place of the Indian fighter Simon Kenton. Pop., 1900, 6808; 1910, 7739.

URBAN SERVITUDES (from Lat. *urbanus*, relating to a city, from *urbs*, city). Easements or rights existing for the convenience or benefit of houses or other buildings, over lands or buildings belonging to a different owner. The term is employed to distinguish such servitudes from those established for the benefit of land only, which are known as rural servitudes. The most important urban servitudes are: The right to support, e.g., of resting joists and other timbers on an adjoining building; the right to have rain drip from the eaves of a building on another's land or building; the right to establish and maintain windows overlooking another's land; the rights of air and access. In New York the right to light and air is restricted to property abutting upon a highway, as the right is considered as a part of the privilege of access to and from the highway. Consult Washburn on *Easements*. See EASEMENTS.

URBAN TRANSPORTATION. Transportation from one point to another within a city at first was provided by coaches and other horse-drawn vehicles. Even in very early times the city required a license, or some form of registration for vehicles engaged in carrying passengers for hire. Soon after cars and rails were used for freight their availability for passengers was appreciated. The first railway was a coach, drawn by horses, running on iron rails, and as the city streets supplied a convenient and desirable route street railways developed. The right to lay tracks and operate cars for the transportation of passengers through city streets was, of course, necessarily under the direct supervision of the city. Later this was extended to lines either above or below the street surface, and the principal forms of urban transportation now are by electrically operated surface roads, cable-operated surface roads, electrically operated elevated roads, and electrically operated subways, and horse-drawn cabs, coaches, or omnibuses and motor vehicles. Almost without exception American cities require licenses for cabs and automobiles, and the various forms of railways operate under franchises granted by the city. The tariffs which cabs and automobiles may charge for given distances are specified in their licenses, and the franchises under which surface, elevated, or subway railways or omnibus lines operate almost invariably specify the charges which the company may make.

Many of the early franchises for street railways gave the railway company the right to operate over certain routes in perpetuity. A five-cent fare was prescribed for any point within the city limits, in this respect differing from European practice where fares by zones often prevail. This five-cent fare, while not universal, is the fare which by far the greatest proportion of the American street railways charge. In some cities tickets are sold six for 25 cents, and in some cities three-cent fares, or even less, have been provided for in the franchises. The actual amount received per passenger per continuous trip on one car is generally considerably less than five cents, even where the street-railway companies' franchise provides for a five-cent fare. This is because a system of issuing transfers from one line to another is made obligatory under most street-railway franchises or by special statutes.

The progress of the mechanical means of urban transportation has been (1) horse car, (2) a car dragged along by a cable running underground, (3) a car propelled by electricity deriving its current from an overhead trolley, and (4) a car propelled by electricity deriving its current from an underground contact. Street-railway systems in American towns and cities were begun in most cases by local capitalists, and in the larger cities three or four different companies were given franchises over different streets or in different parts of the city. The later tendency has been, however, to combine the various companies operated in one city under one management, and to combine the lighting, electric-railway, and often the gas facilities of towns under one financial organization, and holding companies have been formed to control these public-utility corporations, as they are called, in a number of towns. Some of these holding companies control the street-railway and lighting facilities in a hundred or more towns and cities. Under this form of control it has been possible to raise large quantities of capital from investors who would hesitate to put their money into a single property in some town about which they knew nothing, and which was possibly two or three thousand miles from their place of residence. On the other hand, this form of financial organization makes it peculiarly difficult to form any adequate judgment as to the profitableness of urban transportation as distinguished from the other activities, lighting, manufactured gas, etc., of the public-service corporations.

A fairly typical example of a street railway in a small city is that of Portsmouth, Ohio. This city has about 27,500 inhabitants. Its street railway is electrically operated with standard 4′ 8½″ gauge; the total mileage is 12; the weight of rail varies from 48 pounds to 70 pounds to the yard; the street-railway companies' franchise runs for 25 years, and the franchise provides for one per cent of the gross earnings to be paid to the city in lieu of paving and other improvements to the streets. This 12-mile street railway carried 4,206,000 passengers in 1914. In the largest cities, such as New York, Chicago, Boston, and Philadelphia, the surface railway lines are supplemented by elevated lines and by subways.

The elevated lines of New York are the oldest in the United States and were originally operated with small steam locomotives. The elevated lines of Philadelphia, Chicago, and Boston were built after electric-railway operation had been tried out, and were built for operation by electric current supplied to trains from a third rail. A short description of the urban transportation systems of some of these cities will make clear how complicated this problem of urban transportation is. The total length of main lines of surface street railway in Boston in 1915 was 231 miles, of which mileage 197 miles had a second track. There were approximately 14 miles of rapid-transit track, all of which had second track. The gross earnings of this system in the fiscal year ending June 30, 1915, was $17,269,000, and total operating expenses amounted to $11,288,000. The total number of passengers carried was 346,317,000. The total number of car miles run was 57,806,000. The rapid-transit facilities include both elevated lines and subways.

The Chicago Railways Company, which does not operate all of the railways in and about Chicago, but which operates the principal surface lines and the elevated lines (Chicago up to 1916 had no passenger subway lines), operates 500 miles of track. The company has two power-generating stations. It operates under a 20-year franchise, which provides, however, that the city may buy the property at an agreed valuation plus capital expenditures, which are made on the property subsequent to the date of valuation. In 1913 the agreed valuation of this property was $83,757,957. The company is permitted to charge a straight five-cent fare, but must give universal transfers. There is an agreement between the city and the company, by which the company is to pay to the city 55 per cent of surplus earnings over and above operating expenses and five per cent on the agreed valuation. The agreed valuation is raised year by year by the amount which the company spends for additions and betterments. In 1915 the total operating revenues of this system were in round numbers $31,966,000; operating expenses, $19,889,000; 5 per cent on the agreed valuation as of that year called for $4,117,000, and after the payment of rentals and the share belonging to another railway company there was $3,064,000 left to be divided between the city and the Chicago Railways Company. Of this the city got $1,685,000. While this partnership agreement has not been in effect long enough to permit of any final conclusions being drawn in regard to its operation, up to 1915 it has proven quite satisfactory to both the city and to security holders of the railway company.

It has been peculiarly easy for politicians to arouse antagonism against public-utility corporations, and especially against the street railways. The unavoidable annoyance which every one experiences on crowded cars, and the fact that citizens feel as helpless against a street-railway corporation as they do against any other form of monopoly, makes it a temptation on the part of candidates for city offices to conduct a campaign based on a promise to get something out of the street-railway company. Furthermore profits have often appeared very large, and then it has been discovered that the assets of the company have been consumed in the process of earning what appeared to be profits, and the security holders are left with comparatively little to show for their investments. The scheme of having the city a partner to share these profits has taken away something of the incentive to show abnormal profits at the expense of the deterioration of assets, and has also lessened the jealousy with which a peculiarly profitable year of street-railway operation is viewed by the average citizen.

The urban transportation system of Greater New York presents the most complicated aggregate of street-railway lines, elevated lines, and subways of all cities in the world. At Grand Central Terminal, 42d Street and Fourth Avenue, provision has been made for five levels of urban transportation facilities. The uppermost of them is the elevated road, operated by electricity from a third rail; below this is the electric surface line, operated by electricity from an underground contact; below this is the four-track subway which has been in operation since 1904; below this again is the subway built to supplement the old system of subways and elevated lines; and still lower is the Belmont Tube, as it is called, which is a tunnel built from Fourth Avenue and 42d Street east under the eastern half of Manhattan Island and under the East River to Queensboro, Long Island.

The history of New York street railways illustrates in a striking manner some of the phases of the development of urban transportation in the larger cities of the United States. The first street railways were horse-drawn cars, and there were still horse-drawn cars in Manhattan in 1916. The shape of Manhattan and the fact that it is an island which, on the west, south, and east, is separated from the mainland or other islands by a broad body of water, while on the north it is separated from the mainland only by a narrow stream, make it necessary to provide for a very heavy traffic north and south bound, with a comparatively light traffic east and west bound. As fast as transportation could be provided, the city spread northward, and land values rose with great rapidity. The north and south elevated lines, which were at first operated by steam locomotives trailing five or six cars, have already been mentioned. The horse-car line, which ran north and south on Broadway, was replaced by a cable road, and apparently the profits, from this and from the elevated roads and horse-car lines, were out of all proportion to the amount invested. When, however, it was found that electrically operated surface cars were more desirable from every point of view, an additional huge investment had to be made in the substitution of electric cars, with underground conduits, for the old cable cars. During the time of operation by cable and horse cars nothing had been accumulated as a reserve against depreciation or obsolescence of that form of locomotion. The entire cost, therefore, of the electric railways was superimposed on the original cost of cable railways and of horse-car lines, and the various companies operating these lines were merged through the creation of holding companies which not only had to raise great sums of money for additional investment, but also took in the old lines at a very extravagant capitalization. The law required street railways operated by the same company to give free transfers. No time limit was punched on a transfer except the date, and it was possible for a person to ride almost all day on one five-cent fare. The result of operating conditions such as this and of excessive capitalization was bankruptcy for all of the important street-railway companies, exclusive of the elevated roads in Manhattan.

In the meantime an extensive system of urban transportation had been developed in Brooklyn which connected with lower Manhattan by operating cars across the Brooklyn Bridge. There were four sets of tracks on Brooklyn Bridge, two used by surface cars and two by the elevated railways of Brooklyn. The Brooklyn elevated roads, like Manhattan, were at first operated by small steam locomotives and were later converted into electric roads operated from a third rail. One holding and operating company got control of the greater part of the transportation facilities of Brooklyn, and there were years in which one set of politicians would use persecution of the Brooklyn Rapid Transit Company as a campaign issue to get into office, alternating with years in which the Brooklyn Rapid Transit Company, with connivance of local politicians, gave the city a very indifferent service. Within recent years conditions have very greatly improved. The financial structure of the Brooklyn Rapid Transit was strengthened until its credit ranked with that of steam railways and the service brought up to the standard which a city of that size might reasonably expect.

In 1902 New York City entered into an agreement with the Interborough Rapid Transit Company, by which that company was to build a subway running from the Battery to 96th Street, and there branching with one line to 250th Street and Broadway, and the other to 180th Street and Bronx Park. This company also undertook to build a double-track tunnel under the East River, from a point south of Bowling Green to a point in Brooklyn. The Interborough Rapid Transit in 1913 also leased the elevated railways in Manhattan. The mileage of the subway described above had a total length of 25.72 miles, and the elevated lines taken over had a total length of 37.67. Of the subway mileage 7.50 miles were four-track road, 7.18 miles three-track road, and 10.41 miles two-track road, leaving less than a mile of single track. The extension into Brooklyn permitted the Interborough Rapid Transit to compete with the Brooklyn Rapid Transit for business between the two boroughs. This temporarily relieved the congestion of traffic at the rush hours, morning and evening, on Brooklyn Bridge, but so quickly does population follow rapid-transit facilities in New York that within four years after the opening of the subway connecting the two boroughs, the pressure of traffic over Brooklyn Bridge was as great as ever, and additional facilities were urgently demanded.

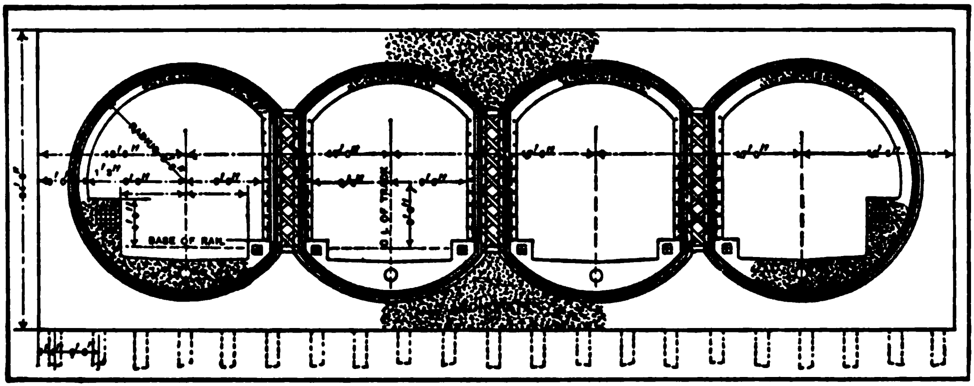
Negotiations which had been going on for some years between the New York Public Service Commission, the duty of which was to regulate New York City urban transportation facilities, the Brooklyn Rapid Transit, and the Interborough Rapid Transit, for the construction of additional facilities, took definite shape in 1911 and were finally consummated in the contracts which were signed March 19, 1913, between the city of New York and the Municipal Railway Corporation, and contracts which were signed at about the same time between the Interborough Rapid Transit Company and New York City. This agreement provided for the construction of what is known as the dual subway system. The New York Municipal Railway Corporation was the subsidiary of the Brooklyn Rapid Transit, and the new subway system was to be built in part by money furnished by the city of New York and in part by money furnished by the Brooklyn Rapid Transit Company and the Interborough Rapid Transit Company. In addition to a system of subways the Brooklyn Rapid Transit and the Interborough Rapid Transit agreed to extend their elevated lines and to add to the capacity of these lines by, in some instances, third tracking them, and in other instances adding a second story to the elevated structure to carry two additional tracks.

The problem of adequate transportation facilities at Chicago is not as complicated as that at New York, and the general scheme adopted is that of having a circular elevated line making a loop about the business section of the city. From this loop elevated lines radiate out into the residential districts. Elevated trains can therefore come in in the morning from the residential districts, discharge their passengers on the various stations on the loop, and go back out. This makes a very heavy traffic during rush hours on the loop, but since the lines radiate in three directions the traffic as soon as it leaves the loop has comparatively little congestion.

New York Subways. As previously stated, the city of New York has the most extensive system of subways in the United States. The first subway system consisted of over 20 miles of road, much of which is four track. This is being supplemented by the above-mentioned dual subway system. The construction of both the first subway system and the dual system was carried on by private contractors, who submitted bids to the New York Public Service Commission, and whose bids and work were subject to the approval of the commission. The character of the work north of 53d Street was largely through solid rock. South of Houston Street it was almost entirely sand, no blasting was necessary, and the excavated material could be dislodged with pick and shovel. Here it was necessary to underpin buildings along the route and to use an elaborate system of timbering to hold up the sides of the cut and sustain the temporary pavement in the street. In the construction of the new dual subway it was necessary to go under a part of the old Astor House, the oldest of New York's first-class hotels standing in 1910, and cross a corner of St. Paul's Churchyard, and all of this work necessitated elaborate precaution for the prevention of cave-ins.

The first subway was necessarily experimental in some particulars. In general its design has been found to be particularly satisfactory. Its operation, however, has brought out certain defects which are avoided in the dual subway. Some of the stations of the first subway were built on curves. Operation of the subway during morning and evening traffic is carried on at the greatest possible physical capacity, and the fact that trains have to slow down when they approach stations situated on curves sooner than they would were the stations on tangent tends to produce congestion at these points. The curved platform also leaves a considerable space between the car platform and the station platform, which, in rush hours, is a source of danger.

The first subway, throughout the greater part of its four-track sections, had all four tracks placed in one tunnel. This arrangement interferes with the full effect of train movement on ventilation. Frequent passage of trains stirred up the air, but did not renew it, and various ventilating devices have had to be installed. The dual subway has a partition between each pair of tracks, so that there will be a tunnel for trains going one way and another tunnel for those going in the opposite direction. In this operation wall archways have been provided at frequent intervals as places of safety for track laborers. Where there are only two tracks, these are separated by a partition. The accompanying drawing shows a cross section of the four-track subway under the Harlem River, where each one of the four tracks is to be placed in a separate tunnel. In summer the heat in the first subway has been excessive. Much of this heat is believed to be due to friction of brake shoes on wheels and wheels on tracks, and also of course to the operation of the electric motors underneath the cars. In the first subway waterproofing was used under the floor, up the sides of the tunnel, and over the roof, and, while this waterproofing keeps the water out, it keeps the heat in. In the dual subway less waterproofing is being used and is placed only along the sides where the tunnel runs below the water level, as is the case in the accompanying cross sectioning. The waterproofing used in the dual system consists of layers of woven fabric and asphalt and brick laid in asphalt. The first subway has a height of 12 feet, 10 inches above the base of the rail and has a width of 12 feet, 6 inches for each track. The new Fourth Avenue and Centre Street subways have a maximum height of 15 feet above the base of the rail and a width of 14 feet for each track. The Broadway subways have a height above the base of the rail of 13 feet, 2 inches and a width of 13 feet, 6 inches for each track. Express stations in both the first subway and the dual subway are built to accommodate ten-car trains and local stations to accommodate six-car trains. Originally the first subway was built with express stations to accommodate but eight cars and local stations to accommodate but five cars. These, however, were later lengthened.



CROSS SECTION OF FOUR-TRACK SUBWAY UNDER HARLEM RIVER OF NEW YORK DUAL RAPID-TRANSIT SYSTEM.

The first subway was built in good part as an open cut, which was later roofed over. The dual subway has been built almost entirely as a tunnel, the street surface being maintained as a roof, thus minimizing the interference of street traffic.

London. The transportation facilities of the city of London may be classified under the head of cabs, omnibuses, tramcars, local railways, and trunk-line railways carrying the passengers from a 30-mile limit.

The report of the London Traffic Branch of the Board of Trade shows that the population of the County of London, which is the Metropolitan District, decreased from 4,536,269 in 1901 to 4,521,685 in 1911, and it is estimated that the migration into the outskirts from the Metropolitan District has been more rapid since 1910 than in the years preceding. The population of the whole area of Greater London increased from 6,581,402 in 1901 to 7,251,358 in 1911 and is given by the Registrar General at 7,340,079 for 1912. The report of the Select Committee on motor traffic shows that the number of passengers by tramway in 1911 was 821,819,741; by omnibuses, 400,628,487; by local railways, 436,398,745; and by trunk-line railway from a 30-mile limit, approximately 250,000,000.

Omnibus service in London plays a very important part in the urban transportation, as will be seen from the above figures. The shortest omnibus route, according to the report of the Select Committee, made in 1912, was 2.2 miles and the longest was 18.9 miles, and the total number of omnibuses required for service on week days in 1911 was 2279 and on Sundays 3390. An investigation made by the London police shows that on Oct. 13, 1913, there were 2700 busses in daily operation and an average of about 300 in the shops. The average fare per passenger on omnibuses in 1913 was 1.12 pence (2.24 cents). There is no transferring between the various bus lines. A report made by George Keegan and E. T. Wood, assistant to the vice president and general manager of the Interborough Rapid Transit Company and assistant to the vice president and general manager of the New York Railways Company, respectively, estimated that, considering the difference in the purchasing power of money in London and New York, the average of 2.24 cents for London is somewhat higher than the average 3½ cents paid by passengers on the New York surface car lines. The average length of ride of passengers on the busses is about 1.6 miles, according to the report of the Select Committee, and the average ride per tramway passenger is 1.93 miles. Employees and policemen in uniform are carried free.

The frequency of bus service in London varies from 1 minute headway to 15 minutes. The busses make from 110 to 120 miles a day, carrying 34 seated passengers, of which 18 are on top and 16 inside. Busses stop almost anywhere to take up passengers.

Underground Lines.—The report of the London Traffic Board of Trade for 1913 shows the mileage of electric so-called underground railways in the metropolitan area to be 132 miles; of this, 60 route miles are underground and the remainder on the surface. All of the underground electric railways are controlled by one of three companies: the Underground Electric Railways Company of London; the Metropolitan Railway Company; the Great Northern and City Railway Company. In 1912 the Underground Electric Railways Company carried 226, 894,711 passengers, outside of season-ticket passengers, and 20,459,828 season-ticket passengers. In 1913 this system carried 225,990,674 passengers, outside of season-ticket passengers. The passenger receipts in 1912 were £1,772,791 ($8,863,955) and, in 1913, £1,791,957 ($8,959,-785). Various reports which were made in 1912 and 1913 by the Underground Electric Railways Company's management and by boards of trades comment on the success with which motor busses have been competing for not only the normal increase in traffic, but for the passenger traffic which had previously belonged to the underground railways.

The Metropolitan Railways Company, which was the old underground before the Underground Electric Railways of London entered the field, and which was originally operated with steam locomotives, carried, in 1912, 100,146,324 passengers. The average receipts per passenger were 1.486 pence (2.972 cents). Workingmen are carried at a reduced rate and in some instances may travel 16 miles for 2 pence (4 cents). Round-trip tickets are sold, which are roughly one and a half times one-way tickets.

The total number of passengers carried on all of the electric railways, including the Underground Electric of London and the Metropolitan Railway, mentioned above, was 360,325,001 in 1912. The equipment of the underground railways consists of cars of many different types. The average number of seats is 48.

Tramways.—With a few exceptions, all of the tramway lines in the County of London are operated by the London County Council. The report of the London County Council shows that, for the year ending March 31, 1913, there were 512,652,653 passengers carried on the tramways; the passenger revenue was £2,181,103 ($10,905,515); the average receipts per passenger carried was 1.02 pence (2.04 cents); and the car miles operated was 53,943,104. The average number of cars in use on electric lines was 1.237 in 1913, and a large number of trailer cars are in use, many of which have double decks. The ordinary car seats 36 persons downstairs and 42 persons upstairs. The trailer cars seat 48 persons. The cars are operated within the more congested city limits from underground trolleys, but many of them are equipped to operate also by overhead trolleys, and change at points on their way to or from the city from one system to the other.

Paris. The principal means of urban transportation in Paris, France, are subway lines, omnibuses, tramway lines, taxicabs, steam-car lines entering Paris, and the small steamers running on the Seine. According to the 1911 census, the population of the city of Paris within the fortifications was 2,888,110. The population of the environs was about 460,000. The subways of Paris are all under the control of the Chemin de Fer Metropolitain, with the exception of one line operated by a steam-railroad company. All of the lines lie entirely within the fortifications of Paris; some of them are elevated instead of being in subways. In the fiscal year ending June 30, 1912, the total number of passengers carried on this Metropolitan system, not counting transfer passengers, was 383,190,-000. This compares with 302,973,856 passengers carried in the same year in the New York City subway. First-class tickets on the Paris subways are 25 centimes (about 5 cents) and second-class tickets 15 centimes (3 cents). Second-class tickets to go before nine A.M. and return any time during the day, are sold for 4 cents. There are no reduced-rate return tickets for first-class passengers. Approximately the total passenger traffic is divided into 15 per cent first-class passengers, 55 per cent second-class passengers, and 30 per cent second-class passengers go and return. As a rule there is no limitation on transfer privilege in the subway, except an attempt to prevent a system of transfers which would permit a passenger to return to his starting point.

Equipment.—Subway trains are usually made up of five cars, the centre car being a first class and the other four cars second class. The capacity varies from 50 to 90, the rated capacity being for about an equal number of standing and sitting passengers. There is a congestion at morning and evening hours, and sometimes as many as 75 standing passengers per car, but even a report made by representatives of the Interborough Rapid Transit Company and the New York City Railways, mentioned previously, says that the rush-hour congestion in Paris is not nearly so great as that in New York. The headway between trains during rush hours is 2 minutes, 11 seconds, and the distance between stations is about 1600 feet. There is no express service.

Omnibuses.—The General Omnibus Company of Paris controls all of the busses, and in 1913 owned about 1032 busses, of which 850 were in daily service. The bus lines do not extend beyond the fortifications, and there is usually not more than one bus line on a street. These lines usually run from the outgoing points to the centre of the city, and none of them run all the way across the city. There is usually from two to three sections on each bus line, and the fare for one section first class is 15 centimes (3 cents) and second class 10 centimes (2 cents). A person riding over more than one section, or beyond the limits of one section, pays 25 centimes (5 cents) first class and 15 centimes (3 cents) second class. The length of a section is about 1⅞ miles. Standing passengers are permitted on the rear platform only, and the distance between stopping points is about 1300 feet. The most frequent headway is 1 minute, 10 seconds, and the headway varies from this to about 7 to 8 minutes. The average speed of the busses is about 8½ miles an hour, and the maximum is 14 miles an hour. The busses accommodate 30 to 35 passengers. Single-deck omnibuses are used, the double-deck busses having been abandoned on account of expense and the greater time required to load and unload.

Tramways.—The two largest tramway companies are the General Omnibus Company and the Tramways de Paris et du Departement de la Seine. The arrangement of the lines is on the zone principle, and passengers pay fares for each zone. The fare is usually 15 centimes (3 cents) for each zone first class and 10 centimes (2 cents) for each zone second class. First-class passengers pay about 2.4 cents for each mile outside of the fortifications and a little less than 1 cent for each mile within the fortifications. Cars operating single or in trains of two cars, and in the suburbs of three cars, are run by compressed air, steam, storage battery and overhead trolley, or underground electric trolley. There are both single and double deck cars in use. Various types and sizes of cars are in use, many having a seating capacity for 30 passengers and a standing capacity for 19 passengers. The trailers have, in many cases, seating capacity for 38 passengers and will carry 19 standing passengers.

The report of the Inspector General of Police, in charge of tramways and local railways, for the year ending Dec. 31, 1911, shows a total number of passengers carried by tramway lines as 438,634,210; omnibus lines, 135,722,473; subways, 419,894,539; a total of 994,262,222.

Municipal Ownership. As an example of municipal ownership and operation of street railways, Leith, Scotland, may be taken as an instance where this form of management is in successful operation. The tramways department of the Burgh of Leith operates a little over 9 miles of tramway, nearly all of which is double track. This serves a population of 80,400. The total revenue in 1913 was £35,693 ($178,465). The total number of passengers carried was 9,706,611 and of car miles run was 944,329. The average car miles per car per day was 125. The average total revenue per car miles was 9.07d. (18.14 cents) and the average expenses, including power cost, was 4.08d. (8.16 cents). The average fare paid by each passenger was 0.87d. (1.74 cents).

Since 1894 the corporation of the city of Glasgow, Scotland, has operated the tramways of that city. The city between 1894 and 1903 had changed the system from horse cars to overhead trolley and extended it from 60 miles to 132. In 1903 the car mileage was 14,008,750, the number of passengers carried 177,179,549, and total receipts amounted to £653,200 ($3,266,000). Fares are on a mileage basis, the half mile being taken as the unit. The fare for the first 0.58 mile is ½d. (1 cent) and is graded from that figure up to 4d. (8 cents) for 9.09 miles.

Consult: A. H. Beavan, *Tube, Train, Tram, and Car* (New York, 1903); E. R. Johnson, *Elements of Transportation* (ib., 1909); W. F. Gephart, *Transportation and Industrial Development in the Middle West* (ib., 1909); L. G. McPherson, *Transportation in Europe* (ib., 1910). See STREET RAILWAY; TUNNEL.

URBINO, o͞or-bē'nō. A city in the Province of Pesaro e Urbino, Italy, situated on a hill amid the eastern outliers of the Apennines, between the Metauro and the Foglia, 25 miles southwest of Pesaro (Map: Italy, D 3). The streets are narrow and tortuous, but gorgeous views are obtained of the mountains and the Adriatic. The house in which Raphael was born is now fitted up as a museum, and belongs to the Reale Accademia Raffaello. The new cathedral is interesting for its paintings. In the church of Santo Spirito are noteworthy pictures by Luca Signorelli, and in the San Domenico are good reliefs by Luca della Robbia. The Oratorio della Confraternità di San Giovanni Battista is a splendid structure. The famous ducal palace was erected in the fifteenth century. It is rich in interesting sculptures and decorations, and has a collection of Roman inscriptions and a biblical picture gallery. The city has a free university, founded in 1671, and an academy of fine arts. The celebrated library has been removed to Rome. Urbino manufactures silks, majolica, bricks, lime, oil, and cheese. There are in the vicinity sulphur and travertine quarries. Pop. (commune), 1901, 18,307; 1911, 18,117.

Urbino, the ancient Urbinum, was an important city under the Romans. It became very prosperous in the fourteenth century. Federigo da Montefeltre, who ruled from 1444 to 1482 and who was elevated by the Pope to the dignity of Duke of Urbino in 1474, maintained a magnificent court, built the palace, and made the city a centre of science and art. During the sixteenth century, under the Della Rovere family, Urbino was important in the manufacture of majolica. It was a papal possession from 1626 to 1860.

URBS VETUS. See ORVIETO.

URCHARD, SIR THOMAS. See URQUHART.

URCHIN, KEYHOLE. See SAND DOLLAR.

URDANETA, o͞or'dȧ-nä'tȧ. A town of Luzon, Philippines, in the Province of Pangasinán, situated 27 miles southeast of Lingayen (Map: Philippine Islands, C 2). Pop., 1903, 20,544.

URDU, o͞or'do͞o. The speech of the Mohammedan population of central Hindustan, and a sort of lingua franca for almost all the peninsula. See HINDUSTANI LANGUAGE AND LITERATURE.

URE, ALEXANDER. See STRATHCLYDE, ALEXANDER URE, BARON.

URE, ANDREW (1778–1857). A Scottish chemist, born at Glasgow. He studied at Glasgow and Edinburgh. In 1802 he became professor of chemistry and natural philosophy in the Andersonian Institution at Glasgow; took an active part in the establishment (1809) of the Glasgow Observatory, and was appointed its first director. He published a number of valuable works, his two dictionaries remaining for many years the standard books of reference: viz., his *Dictionary of Chemistry* (2 vols., 1821), and *A Dictionary of Arts, Manufactures, and Mines* (1837 and several later editions).

U'REA (Neo-Lat., from Gk. *οὖρον*, *ouron*, urine), or CARBAMIDE, $CO(NH_2)_2$. An organic substance which derives its name from its having been originally discovered in urine, of which it forms the most important and characteristic ingredient. Pure urea is devoid of smell, has a coolish, bitter taste, like that of saltpetre (which it closely resembles in its external form), and is very slightly deliquescent. It is readily soluble in water and alcohol, but only slightly in ether. It melts at 132° C. (270° F.); dry urea may be sublimed without decomposition by heating in vacuo between 120° and 130° C. (248°–266° F.). If sublimed in vacuo at temperatures between 160° and 190° C. (320°–374° F.), it changes into ammonium cyanate. If heated, under ordinary pressure, to 150°–160° C. (302°–320° F.), it is decomposed with formation of ammonia, cyanuric acid, biuret, and carbonic acid; the formation of biuret is represented by the following chemical equation:

$$\underset{\text{Urea}}{2CO(NH_2)_2} = \underset{\text{Biuret}}{NH_2CONHCONH_2} + \underset{\text{Ammonia}}{NH_3}$$

The formation of cyanuric acid ($C_3H_3N_3O_3$) takes place indirectly, probably through the combination of biuret with cyanic acid.

One of the most important methods for the quantitative determination of urea in urine was proposed by Folin in 1901 and improved by Benedict in 1910. The method consists in adding to a small measured specimen of urine a certain quantity of hydrated magnesium chloride, some acid potassium sulphate, some zinc sulphate and a little powdered pumice and paraffin wax, boiling to dryness, heating for an hour at 165° C. (329° F.), adding sodium hydroxide, and distilling the freed ammonia into a measured quantity of tenth-normal acid. From the amount of ammonia thus obtained, the amount of urea in the urine specimen is readily calculated.

The presence of urea may be detected qualitatively by means of the biuret reaction. It has been mentioned above that when urea is decomposed by heating, biuret is produced along with several other substances. Now, when biuret is dissolved in water, then some caustic soda and a little dilute copper sulphate solution added, a characteristic pink coloration is produced. To detect urea, therefore, the dry substance submitted for examination, or the residue left on evaporating a solution, is heated for some time at 155° C. (311° F.), then dissolved, and treated with caustic soda and copper sulphate, a pink coloration produced proving the presence of urea.

Urea was the first organic compound produced artificially in the chemical laboratory—a synthesis of vast importance in the history of chemistry. (See CHEMISTRY.) It was then (1828) obtained by Wöhler (q.v.) by heating a solution of ammonium cyanate, the transformation taking place according to the following chemical equation:

$$NH_4OCN = CO(NH_2)_2$$

Ammonium cyanate — Urea

Urea has since been made artificially in a variety of ways; e.g., by treating ammonia with phosgene gas (carbonyl chloride). This synthesis is important inasmuch as it explains the structure of urea.

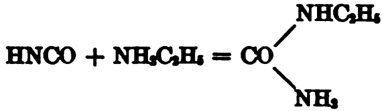
Urea is best prepared in the laboratory by heating phenyl carbonate with ammonia:

$$(C_6H_5)_2CO_3 + 2NH_3 = CO(NH_2)_2 + 2C_6H_5OH.$$

It may be obtained from urine by evaporating to a small volume and adding nitric acid; the nitrate of urea thus obtained is purified by crystallization from nitric acid, decomposed with barium carbonate, and the urea set free is dissolved out of the mixture with alcohol.

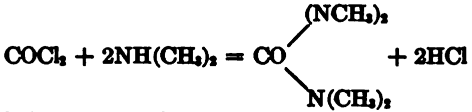
Urea occurs more abundantly in the urine of carnivorous than in that of herbivorous animals. Small quantities of urea are present also in the urine of birds. The average amount of urea normally excreted by the human adult in a day is 33 grams, the quantity varying between 22 and 35 grams. Urea is also a constituent of the fluids of the eye, of sweat, and, in minute quantity, of the blood and of the liquor amnii (of the fœtus). There can be no doubt that it is a final product of the regressive metamorphosis of the living tissues, or of their disintegration into simpler compounds, by means of which the final elimination of the worn-out structures is effected. In what way this process of disintegration takes place in the animal body is not known, though various hypotheses have been advanced in explanation of this important phenomenon. Since urea is readily produced from ammonium cyanate and is with equal readiness transformed into ammonium carbonate (see above), it may be that the decomposition of proteids in the body gives rise first to the formation of one or both of these substances, which are subsequently changed into urea. Such explanations, however, are rather vague; for, although cyanogen compounds are manufactured for practical purposes chiefly from nitrogenous animal refuse, the nature of the chemical transformations taking place during the process is not understood. The cyanate hypothesis is attractive inasmuch as the transformation of cyanogen compounds into urea might serve as a source of much energy, cyanogen compounds possessing great molecular energy, while urea possesses much less energy and is much more stable. See Plate of MICROSCOPY, CLINICAL.

U'REAS, THE COMPOUND. A class of organic substances, for the knowledge of which chemistry is mainly indebted to A. W. Hofmann. It is stated in the article on UREA (q.v.) that that important substance can be obtained by the action of ammonia either on cyanic acid (synthesis of urea by heating an ammonium cyanate solution) or on phosgene gas (carbonyl chloride). Similar transformations take place if, in place of ammonia, compounds are employed which are derived from ammonia by replacing hydrogen in the latter by alcohol radicles, such as methyl (CH_3) or ethyl (C_2H_5). In these cases, however, not urea itself, but a series of compound ureas are obtained, which are said to be derived from urea by substituting an alcohol radicle for hydrogen. These compound ureas are very similar in their chemical behavior to urea itself, and, like urea, form salts with acids. Most of the ureas are crystalline solid substances. Those, however, which are derived by replacing all the hydrogen of urea are liquids that boil at high temperatures and distill without decomposition. Ethyl urea and tetramethyl urea are formed by the above methods, according to the following chemical equations:



$$HNCO + NH_2C_2H_5 = CO\begin{cases}NHC_2H_5\\NH_2\end{cases}$$

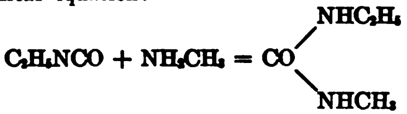
Cyanic acid — Ethylamine — Ethyl urea



$$COCl_2 + 2NH(CH_3)_2 = CO\begin{cases}(NCH_3)_2\\N(CH_3)_2\end{cases} + 2HCl$$

Carbonyl chloride — Dimethylamine — Tetramethyl urea

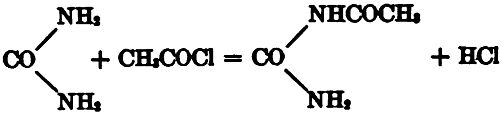
Certain compound ureas may be obtained by using ethereal salts of cyanic acid; thus symmetrical methylethyl urea is obtained by the action of methylamine on ethyl cyanate, the reaction taking place according to the following chemical equation:



$$C_2H_5NCO + NH_2CH_3 = CO\begin{cases}NHC_2H_5\\NHCH_3\end{cases}$$

Ethyl cyanate — Methylamine — Methylethyl urea

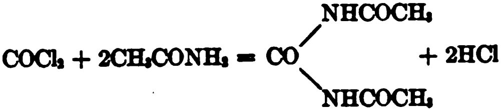
Another important series of compound ureas is obtained by substituting for hydrogen in urea the radicles of organic acids. These ureas are called ureides. One of the hydrogen atoms of urea can be replaced by an acid radicle by the direct action of the chloride of the acid radicle on urea; thus monoacetyl urea is formed according to the following equation:



$$CO\begin{cases}NH_2\\NH_2\end{cases} + CH_3COCl = CO\begin{cases}NHCOCH_3\\NH_2\end{cases} + HCl$$

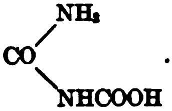
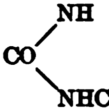
Urea — Acetyl chloride — Acetyl urea

Other methods, however, must be employed for the purpose of introducing more than one acid radicle; thus symmetrical diacetyl urea is obtained by the action of acetamide upon carbonyl chloride, the reaction taking place according to the following chemical equation:

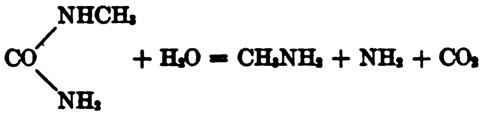


$$COCl_2 + 2CH_3CONH_2 = CO\left\langle\begin{matrix}NHCOCH_3\\ NHCOCH_3\end{matrix}\right. + 2HCl$$

Carbonyl chloride Acetamide Diacetyl urea

Among the important ureides is that of carbonic acid, called allophanic acid. Its formula is  $CO\left\langle\begin{matrix}NH_2\\ NHCOOH\end{matrix}\right.$. It is an exceedingly weak acid, its alkaline salts being decomposed even by carbonic acid. The substance biuret, formed by heating urea somewhat above 150° C. (302° F.) (see UREA), is the amide of allophanic acid, its formula being  $CO\left\langle\begin{matrix}NH\\ NHCONH_2\end{matrix}\right.$. See also URIC ACID.

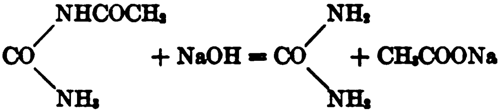
When the alkyl ureas (i.e., the compound ureas formed by replacing hydrogen in urea by alcohol radicles) are boiled with alkalies, decomposition ensues resulting in the formation of amines, ammonia, and carbonic acid. Methyl urea, e.g., is thus hydrolyzed according to the following chemical equation:



$$CO\left\langle\begin{matrix}NHCH_3\\ NH_2\end{matrix}\right. + H_2O = CH_3NH_2 + NH_3 + CO_2$$

Methyl urea Methylamine

The ureides are more or less readily saponified by the action of alkalies; acetyl urea, e.g., being decomposed according to the following equation:

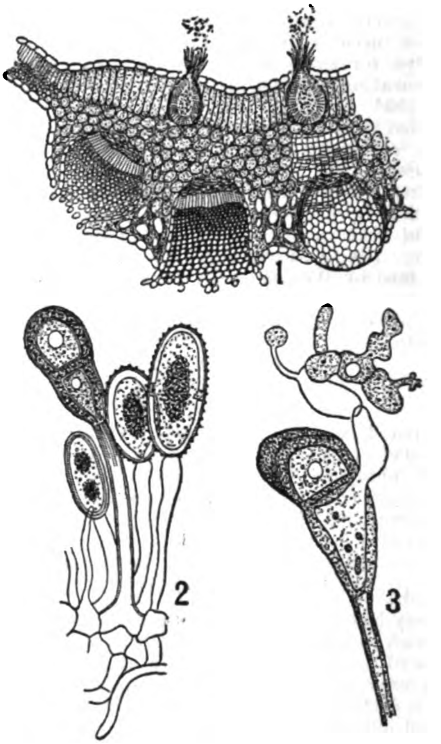


$$CO\left\langle\begin{matrix}NHCOCH_3\\ NH_2\end{matrix}\right. + NaOH = CO\left\langle\begin{matrix}NH_2\\ NH_2\end{matrix}\right. + CH_3COONa$$

Acetyl urea Urea Sodium acetate

UREDINALES, ū-rĕd′ĭ-nā′lēz (Neo-Lat. nom. pl., from Lat. *uredo*, blight, blast, from *urere*, Skt. *uṣ*, to burn). A group of fungi familiarly called rusts which live as parasites chiefly on flowering plants. One of the striking features of the group is the extreme form of polymorphism exhibited, i.e., the production of more than one spore-bearing form in the life cycle. The rusts are known to develop five kinds of spores: pycnospores (spermatia), æcidiospores, uredospores, teleutospores, and basidiospores (sporidia). These do not all occur in every case, the teleutospores and the basidiospores being the only forms always present. The various spore forms may all develop on one host, in which case the rust is said to be autœcious or autoicous; or they may be developed on different hosts, in which case the rust is heterœcious or heteroicous. The teleutospores are the most variable spores, and therefore their characters are of the greatest service in classification.

In such a heterœcious form as *Puccinia graminis*, one of the common wheat rusts, the life cycle is as follows. The mycelium (the filamentous body of the fungus) traverses the tissues of the young wheat plant, and sends to the surface the uredospores, which form the reddish spots or lines that suggested the name rust. By means of scattered uredospores the disease spreads rapidly through growing wheat. As the wheat plant matures, the mycelium sends to the surface the teleutospores, dark and thick walled spores that last through the winter. The teleutospore germinates in the spring, and gives rise to the basidium (promycelium), a filament of four cells, each of which produces a slender branch bearing a basidiospore (sporidium). The basidiospores that fall on young barberry leaves germinate and form an extensive mycelium in the leaf. This mycelium gives rise to pycnospores and æcidiospores. The latter occur in clusters called cluster cups, and these spores, falling upon young wheat plants, germinate and produce the mycelium that later bears uredospores and then teleutospores. In this life history the fungus passes through three distinct phases, viz., the parasitic mycelium bearing uredospores and teleutospores, the saprophytic basidium bearing basidiospores, and the parasitic mycelium bearing pycnospores and æcidiospores.



RUST.

1, section of leaf of barberry with cluster cups (æcidia below and spermogonia above; 2, uredospores and one teleutospore; 3, germinating teleutospore with four-celled promycelium.

As might be expected, the complete life histories of comparatively few heterœcious rusts are known, but the completion of the life histories is progressing very rapidly at the present time. The two hosts do not suggest one another, e.g., wheat and barberry, and therefore numerous rusts are known only in various stages, and bear the names of form genera; e.g., *Uredo* (uredospore forms), *Puccinia* (teleutospore forms), and *Æcidium* (æcidiospore forms). When these forms are connected in a life history the name of the fungus becomes *Puccinia*.

One of the important problems connected with the cereal rusts is the winter condition, and this chiefly relates to the question whether any short cuts in the life history are possible; e.g., whether uredospores can survive the winter and infect the crop of the next season.

For a general account of the Uredinales consult Engler and Prantl, *Die natürlichen Pflanzenfamilien* (Leipzig, 1887), and Plowright, *British Uredineæ and Ustilagineæ* (London, 1889). See Basidiomycetes; Rust.

URE'NA (Neo-Lat., from *uren*, the native Malabar name). A genus of herbs of the family Malvaceæ. The bark is very fibrous; and the fibre of *Urena lobata* and *Urena sinuata*, weeds common in most parts of India, is used as a substitute for flax in making cordage and paper stock. It is strong and fine and in many ways resembles jute, for which it is a good substitute. *Urena lobata* grows in various parts of the United States, particularly in the State of Florida, where the plant has often been mistaken for ramie.

UREÑA, Count of. See Osuna, Duke of.

UREN'TES A'QUÆ. See Orense.

U'RETER (Gk. *οὐρητήρ*, *ourētēr*, ureter, urethra, from *οὖρον*, *ouron*, urine). One of two canals by which the urine is conveyed from the pelvis of the kidney (q.v.) on either side to the base of the bladder. Each ureter is about 18 inches in length, and enters the bladder in so slanting a direction as to prevent regurgitation. When a concretion is formed in the kidney, the ordinary and most favorable event is that it should descend through the ureter to the bladder. The passage of a stone through this tube gives rise to renal colic, a series of violent symptoms, consisting of sudden and most severe pain, first in the loins and groin, subsequently in the testes (in the male) under the thigh; the testes may be retracted spasmodically. Coincident with the pain there are violent sickness, faintness, and collapse, which may last two or three days, and are only relieved when the stone reaches the bladder. The treatment consists in the warm bath, and the inhalation of chloroform or opium in large doses (both of which serve to allay spasm and deaden pain), and the free use of diluents to wash down the concretion.

URE'THRA (Lat., from Gk. *οὐρήθρα*, *ourēthra*, passage for urine, from *οὖρον*, *ouron*, urine). The canal by which the urine is discharged from the bladder. The male urethra is about 9 inches long, and its office is to conduct the seminal fluid, secondarily to discharge the urine. It is divided into three parts: (1) the deep or prostatic urethra, which extends from the outlet of the bladder (with which it is continuous) through the prostate gland, being the part into which the seminal ducts open; (2) the membranous urethra, less than an inch long, extending from the prostate forward; and (3) the cavernous, or spongy, or penile urethra, extending through the erectile tissue to the end of the penis. The female urethra is less than 2 inches in length and opens externally between the upper margin of the vaginal entrance and the clitoris. The urethra is lined by a continuation of the mucous membrane of the bladder, and in the male is extremely sensitive. See Gonorrhœa; Stricture.

URETHRITIS, ū'rē-thrī'tis. See Gonorrhœa.

URFAH, ụr-fä', or **ORFA.** The modern name for Edessa (q.v.).

URFAHR, ōōr'fär. A town in the Crownland of Upper Austria, on the left bank of the Danube, opposite Linz (q.v.), with which it is connected by an iron bridge (Map: Austria-Hungary, D 2). It manufactures spirits and machinery. Pop., 1900, 12,827; 1910, 15,441.

URFÉ, ụr'fā', Honoré d' (1568–1625). A French pastoral romancer, born in Marseilles of noble family. D'Urfé was educated for the Church, but married his sister-in-law, Diane de Châteaumorand (1600). On the fall of the League he withdrew to Savoy and began to write in the pastoral style suggested by the Spanish *Amadis de Gaul*, which had been translated into French at the instigation of Francis I (1540–48), and by the Greek pastoral romances which were rendered into French early in the sixteenth century. Fiction of this character had made a timid appearance in France before D'Urfé, e.g., in Fumée's *Du vray et parfait amour* (1599). It had already acquired its great masterpieces in Italy (Poliziano's *Orfea*, 1471 or 1472; Sannazaro's *Arcadia;* Tasso's *Aminta*, 1573; Guarini's *Pastor Fido*, 1590), in England (Spenser's *Shepherd's Calendar*, 1570), and in Spain (Montemayor's *Diana*, 1542; Gil Polo's *Diana Enamorada*, 1564, and Cervantes' *Galatea*, 1851). All these romances were popular in France, but D'Urfé's *Astrée* was the first that became a sort of social breviary for a generation. It is a novel of 5155 pages. Its first two volumes appeared in 1610, the third in 1619, the posthumous fourth and fifth in 1627, with other unofficial continuations. Of this interminable treatise on the verb *aimer*, D'Urfé borrows his pastoral scenes from the *Diana*, his warlike episodes from *Amadis*, and from the Greeks and Latins some episodes and much of his story-telling art; but he is superior to them all in character drawing, in good humor, and in the higher social aim of his work. In the subtle differentiation of his lovers, D'Urfé is a not unworthy forerunner of Racine and Marivaux, unapproached by any novelist of his century but Madame de Lafayette. D'Urfé was a sort of realistic idealist; he chose the scene of his own birth, the banks of the Lignon, for the scene of his novel, and his conversations are lively, far beyond the wont of his time. His aim throughout is the refinement of society, and here its influence is hard to overestimate. The Hôtel de Rambouillet seems to have been organized in its imitation. *Astrée's* popularity was astounding. Bishops like Camus, saints like Francis de Sales, joined with realistic novelists like Sorel to sound the praise of this "exquisite work." La Fontaine, the scholarly Huet, the sprightly Fontenelle, the cynic La Rochefoucauld, all rejoiced in it. For two generations it was an accepted book of reference on deportment and breeding. In Germany, in 1624, a princely and aristocratic coterie, on organizing an *Académie des vrais amants*, assumed the names of the characters of the *Astrée*.

Consult: Bonafous, *Etude sur l'Astrée et sur H. d'Urfé* (Paris, 1846); Körting, *Geschichte des französischen Romans im 17ten Jahrhundert*, vol. i (Oppeln, 1885); W. Fischer, *Lafontaine and the Astrée of Honoré d'Urfé* (Philadelphia, 1913).

URGA, o͞or'gȧ (Chin. *K'ulun*). The capital of northern Mongolia, situated on the Tola River and the highway leading from Kiakhta (q.v.) to Peking, 175 miles south of Kiakhta (Map: China, J 2). It consists of the Mongolian town, inhabited mostly by lamas, and of the Chinese town, a few miles distant, where the Chinese and Russian merchants live. In the Mongolian town is situated the residence of the head of the Lamaist church in Mongolia. There are also numerous temples surrounded by the houses of the lamas. In the temple of Maidary is a colossal gilt statue of that divinity, over 33 feet high. During the religious festivals the town is visited by great numbers of pilgrims. Pop., about 25,000 Chinese and 13,000 Lamaist monks.

URGEL, o͞or-Hĕl'. An ancient episcopal see in northern Spain, with an interesting history closely related to that of the Republic of Andorra (q.v.). It was also a county, the lordship of which was acquired by marriage early in the thirteenth century by the comtes de Foix.

URI, o͞o'rē. A canton of Switzerland (Map: Switzerland, C 2). Area, 415 square miles. The region consists of the narrow valley of the Reuss, surrounded by offshoots of the Bernese Alps on the west, the Glarus Alps on the east, and the St. Gotthard group on the south. Many of the peaks exceed 10,000 feet, the Dammastoek rising to 11,920 feet. The climate is raw. Uri is primarily a pastoral canton, and exports chiefly dairy products. The principal manufactures are dynamite and parquet floors. The legislative authority is exercised directly by the people assembled in the Landsgemeinde. The canton is represented by one member in the Federal Council. Pop., 1910, 22,055, nearly all German-speaking Roman Catholics. Capital, Altdorf (q.v.).

Uri, first mentioned in 732, passed in the thirteenth century to the Hapsburgs. It gradually obtained its independence and in 1291 formed the perpetual league with Schwyz and Unterwalden. In the fifteenth century the Val Leventina (now a part of Ticino) was acquired by Uri. The canton took part in the Sonderbund (q.v.).

URI. Another name for the Limpopo (q.v.), a river of South Africa.

URIAL. See Oorial.

U'RIAN, *Ger. pron.* o͞o'rē-ăn, Sir. A name, like the modern Mr. Blank, once used to designate one whose real name was either unknown or unmentionable. It occasionally occurs in German and English literature before the nineteenth century, and is sometimes used of Satan. In Wolfram von Eschenbach's *Parzival* it is applied to the evil-minded Prince of Punturtois.

URIBURU, o͞o'rē-bo͞o'ro͞o, José (1835–1914). An Argentine diplomat and president. He was educated at the University of Buenos Aires and entered the diplomatic service, in which he spent 20 years. While Minister to Chile he gave refuge to President Balmaceda (q.v.) during the Chilean revolution of 1891. He was elected Vice President of Argentina in 1892, chiefly because he had no political affiliations. Upon the resignation of President Luís Saenz Peña in 1895, Uriburu assumed the office to fill out the unexpired term. During his administration defense measures were undertaken, bonds were issued to pay off the claims of the foreign-owned railway companies, steps were taken to rehabilitate the credit of the country, and delicate boundary questions with Chile, Bolivia, and Brazil were dealt with. Uriburu was an unsuccessful candidate for the presidency in 1904.

URIC ACID (from Gk. *οὖρον*, *ouron*, urine), $C_5H_4N_4O_3$. A compound of carbon, hydrogen, nitrogen, and oxygen, which forms a loose white powder or scales consisting of minute crystals devoid of smell or taste, only very slightly soluble in water (1 part requiring about 15,000 parts of cold and 1600 of boiling water), and quite insoluble in alcohol and ether. It is soluble without decomposition in strong sulphuric acid, and it may be thrown down from this solution by the addition of water. It is also soluble in the carbonates, borates, phosphates, lactates, and acetates of the alkalies, extracting from these salts a part of their base, with which it forms acid urates. Litmus paper is reddened by its moist crystals, or by a hot aqueous solution. The acid is not volatile, and by dry distillation is decomposed into carbonate of ammonia, urea, cyanuric acid, hydrocyanic acid, etc. Uric acid acts as a very weak dibasic acid, forming with bases two series of salts, the neutral and the acid, of which the former are the more soluble. Among the most important are the acid urates of sodium, potassium, lithium, and ammonium. The urate of lithium is more soluble than any other urate, and hence lithia water is used as a therapeutic agent in converting uric acid and the more insoluble urates into a soluble salt in the living body. The urates are sometimes called lithates, and the acid itself lithic acid.

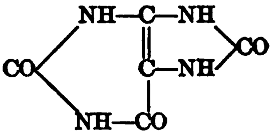
Uric acid is widely distributed throughout the animal organism. It occurs not only in the urine of man (in which it was discovered by Scheele in 1776) and carnivorous animals, but is the chief constituent (either free or in combination) of many calculi occurring in the kidneys or bladder, and of numerous urinary sediments. The urinary secretion of birds and reptiles consists almost entirely of urates, which are also found in the excrements of caterpillars, butterflies, beetles, etc., and of many mollusks. Moreover, in very minute quantities, it occurs as a urate in healthy blood, in which fluid it has been found in excess in gout and in Bright's disease, and is a constituent of the aqueous extract of the spleen, liver, lungs, pancreas, and brain. The chalk stones which occur about the smaller joints and in the lobes of the ear of many gouty patients consist mainly of sodium urate.

The best mode of obtaining uric acid is from guano, or from the excrements of snakes or fowls, which consist largely of urates. For this purpose the mass is boiled with potash, which expels any ammonia that is present, and a stream of carbonic acid is then passed through the strained potash solution, which throws down acid urate of potash. This precipitate is dissolved in water, and decomposed by hydrochloric acid, which throws down the uric acid in minute crystals.

To prove the presence of uric acid, tests of a chemical nature must be applied. The so-called murexid reaction constitutes an excellent test: the substance submitted for examination is treated with a little strong nitric acid, and the mixture is evaporated to dryness at a gentle heat; the residue is moistened with a trace of ammonia, which, if uric acid was present in the original substance, produces a brilliant purple coloration; a drop of caustic soda changes the color to a reddish blue that disappears on warming the solution. The test is based on the fact that warming with nitric acid converts urea into purpuric acid, the acid ammonium salt of which—called murexid—has a brilliant reddish-purple color.

Uric acid and urea (q.v.) are chemically closely related to each other. In mammals nitrogenous substances are disintegrated mainly into urea; in birds the main product of disintegration is uric acid. The formation of both urea and uric acid takes place most probably in the liver.

The products of decomposition of uric acid were first thoroughly investigated, in a series of celebrated researches, by Liebig and Wöhler. Then the chemical relationship of urea and uric acid was clearly established. It has since been shown that uric acid is a diureide, i.e., a substitution product containing two molecules of urea. After much painstaking research, it was possible to demonstrate the true chemical constitution of uric acid, and finally Horbaczewsky succeeded in preparing this important organic substance by a synthetic method; Behrend and Roosen subsequently discovered another synthesis of uric acid, which is relatively simple and perfectly well understood in the light of our knowledge of the constitution of the acid, which is represented by the following structural formula, first proposed by Medicus:



Uric acid.

Consult Alexander Haig, *Causation of Disease by Uric Acid* (7th ed., Philadelphia, 1908), and G. A. Gilbert, *Textbook on Uric Acid and its Congeners* (Danbury, Conn., 1907). See Plate of MICROSCOPY, CLINICAL.

URIC-ACID DIATHESIS. See LITHIC-ACID DIATHESIS.

URICO'NIUM, or **VIR'ICO'NIUM.** An ancient Roman city of Britain, the site of which is about 4 miles to the east of Shrewsbury, and partly occupied by the village of Wroxeter. It is mentioned by Ptolemy as existing in the beginning of the second century of our era, and it is probable that there was a Roman station here before 70 A.D. The traces of the ancient wall show that it had a circumference of about 3 miles, and through it ran the great Roman road now known as Watling Street (q.v.). Exploration of the remains began in 1859. On the north side of the old wall was probably the Basilica, and on the south the public baths. A few inscriptions and numerous small objects, such as coins, brooches, hairpins, pottery, sculptures, etc., found in the ruins are in the museum at Shrewsbury, and some of the buildings excavated have since been covered. The human remains found in the excavations show that the city was sacked and burned by enemies, probably the West Saxons, in the sixth century. Of this, however, there is no historic record. The ruins seem to have remained with little change, except the gradual process of decay, till about the twelfth century, when they were used as material for other buildings. Consult J. C. Anderson, *The Roman City of Uriconium at Wroxeter* (London, 1867), and the *Classical Weekly*, vol. vii (New York, 1913).

U'RIEL (Heb. *Ŭriĕl*, light of God). One of the seven archangels, who personified light and had his dwelling in the sun. He appears in Milton's *Paradise Lost* and Longfellow's *Golden Legend.*

U'RIM AND THUM'MIM (Heb. *ŭrim wĕtummim*). The name given to two objects, perhaps pebbles or stones in the shape of dice, kept in the oracle pouch that hung upon the breast of the Jewish high priest (Ex. xxviii. 30; see EPHOD). They were used to obtain an oracular decision revealing the divine will. While we do not know the precise manner in which this decision was obtained, analogy from similar customs among ancient nations makes it probable that the stones were drawn by lot out of the pouch, and, according to the one drawn, an affirmative or negative answer to a question was given. An entirely satisfactory explanation of the two mysterious names has not yet been furnished, but all the evidence points in favor of a connection with two Babylonian words *urtu*, decision (used chiefly of oracular decisions), and *tamitu*, oracle, which occur in the religious literature of Babylonia. The two words would thus be almost synonymous, and this view is supported by the consideration that they are so used in the Old Testament (e.g., Deut. xxxiii. 8, according to the Greek text), and that Urim at times is used without Thummim (e.g., Num. xxvii. 21 and 1 Sam. xxviii. 6), which shows that the one word conveyed the idea without the help of the other. It is noticeable that Urim begins with the first, Thummim with the last letter of the alphabet. The early explanations, such as "light and perfection" or "light and truth" (Luther's view), are generally rejected as purely fanciful by critical scholars, who hold that the use of the Urim and Thummim belongs to the realm of primitive religious rites, and that its persistence to a late period is due to the strong hold that it had taken upon the Hebrews. In Deut. xxxiii. 8 there seems to be a suggestion that Urim and Thummim originally were in Yahwe's possession but were wrested from him by Moses. It should be added, however, that the notice in Ex. xxviii. 30, where the Urim and Thummim are described as a part of the high priest's costume, without reference to their practical use, marks the transition to the symbolical view, taken in the later Jewish theology, of their significance as tokens of the revelation and guidance granted to Israel through its representative, Aaron. Consult: articles in the *Encyclopædia Biblica* (4 vols., New York, 1899–1903), and Hastings, *Dictionary of the Bible* (1 vol., ib., 1909); also Muss-Arnolt, "The Urim and Thummim," in the *American Journal of Semitic Languages*, vol. xvi (Chicago, 1900); Eduard Meyer, *Die Israeliten und ihre Nachbarstämme* (Halle, 1906); Hugo Gressmann, in *Die Religion in Geschichte und Gegenwart* (Tübingen, 1913).

U'RINE (Lat. *urina*, urine; connected with Gk. *οὖρον*, *ouron*, urine, Skt. *vāri*, *vār*, water, Av. *vāra*, rain, Icel. *ūr*, drizzling rain, AS. *wer*, sea). The fluid which is secreted by the kidneys, stored in the bladder, and evacuated through the urethra in the act of urination. The epithelium lining the tubules of the kidneys elaborates from the blood urea and other products of retrograde metamorphosis, and a transudation or osmosis of water occurs from the interior of the convoluted blood vessels into the cavity of the tubules.

In a healthy human being urine is a clear yellowish or amber fluid of a salty taste and a peculiar aromatic odor, normally acid, and with a specific gravity of about 1.020, and generally containing some mucus. In 24 hours such a person discharges about 50 fluid ounces, or 1500 cubic centimeters, of urine. The amounts of the several urinary constituents passed in 24 hours are approximately as follows:

	Grams
Water	1500.000
Total solids	72.000
Urea	33.180
Uric acid	0.555
Hippuric acid	0.400
Kreatinin	0.910
Pigment and other substances	10.000
Sulphuric acid	2.012
Phosphoric acid	3.164
Chlorine	7.000
Ammonia	0.770
Potassium	2.500
Sodium	11.090
Calcium	0.260
Magnesium	0.207

These constituents, other than water, appear in the urine as: (1) inorganic salts, including sodium chloride; calcium chloride; potassium and sodium sulphates; sodium, calcium, and magnesium phosphates; traces of silicates; alkaline carbonates; nitrates in small quantity; traces of iron. (2) Nitrogenous crystalline bodies, including urea, uric acid, kreatinin, xanthin, hypoxanthin, and occasionally allantoin; hippuric acid, ammonium oxalate; and rarely taurin, cystin, leucin, and tyrosin. (3) Nonnitrogenous bodies, including lactic, succinic, formic, oxalic, and phenylic acids; and rarely sugar in minute amount. (4) Pigments, including urobilin, purpurin, and indican. (5) Other bodies, including ferments from the various digestive fluids of the body. (6) Gases, rarely, in very small quantities, chiefly nitrogen and carbonic acid.

The acidity of normal urine is due to the presence of the acid sodium biphosphate. At times the urine of digestion is alkaline, and frequently urine decomposes rapidly and becomes alkaline. Upon standing and cooling, it frequently becomes cloudy from the urates, and a sediment of pink urates occurs; or in other cases an increase of oxalate of ammonium, together with mucus, forms a thick precipitate or deposit. This occurrence by no means indicates disease of the kidneys, as the laity are apt to imagine. Among the abnormal constituents of urine are blood, pus, epithelium from bladder, kidney, ureter, or vagina, spermatozoa, albumin, fibrin in the form of casts, fats, sugar, etc., during various conditions or diseases. In Bright's disease (q.v.) albumin and casts are generally found.

Urea is determined most easily by a test with hypobromate of potassium. The total excretion each day should be between 300 and 600 grains. Uric acid generally precipitates in a few days if the urine be allowed to stand. Sugar is generally detected by using a solution of sulphate of copper, which is reduced and precipitated in the form of the orange-colored oxide in the presence of glucose. Albumin responds to boiling or the nitric-acid test, either of which causes a permanent cloud in the urine if albumin be present. Phosphates cause a white cloud on boiling the urine, which is dissolved and cleared away by adding a drop of acetic acid. Chlorides, ammonia, and urates have their special chemical tests.

Urinary Deposits are of rare beauty and interest under the microscope. Besides blood, pus, and epithelial cells occurring during grave illness, several crystals are found in ordinary urine with slight variations in health. After standing for a time at a moderate temperature, amorphous granular matter precipitates in most specimens of urine, soluble by heat, and composed of the urates of calcium and magnesium with the acid urates of potassium, sodium, and ammonium. These deposits are probably caused by the excess of phosphoric acid furnished by the acid sodium biphosphate, which decomposes the alkaline urates. After a longer period, from a few days to two weeks, alkaline fermentation supervenes, due to the presence of yeast fungus and mucus. During this process urea is converted into carbonate of ammonium. As this fermentation begins, the uric-acid crystals, occurring as red pepper dust in the receptacle, begin to dissolve, while adhering to their fragments we find prismatic crystals of urate of sodium and spheroids of urate of ammonium. When the alkalinity of the urine is established amorphous granules of phosphate of lime appear, together with triangular prisms of triple phosphates of ammonium and magnesium, and octahedral crystals of oxalate of calcium.

These changes may progress in the pelvis of the kidney or in the bladder. Uric-acid gravel or calculus is found in either situation, causing much pain and a grave pathological condition, as the changes in the mucous membrane lining either cavity are important. (See CALCULUS.) Uric acid or urate calculi are generally red and quite hard. Oxalate calculi are usually found, when present, in the pelvis of the kidney, and are of such shape and color as to be called mulberry calculi. Phosphatic calculi are white and soft, and often appear as dust. Calcium carbonate, cystin, and xanthin calculi are rare. Calculi may be prevented, and probably phosphatic calculi may be dissolved in the bladder by the use of alkaline waters, lithia waters, or salicylates. They cause severe inflammatory conditions in most cases. See INDICAN; LITHIC-ACID DIATHESIS; MICROSCOPY, CLINICAL; PHOSPHATIC DIATHESIS. Consult E. C. Simon, *A Manual of Clinical Diagnosis* (8th ed., Philadelphia, 1914).

URINE, INCONTINENCE OF, or ENURESIS. A common affection in childhood but sometimes occurring in advanced life. The child discharges its urine in bed during sleep. The habit may often be broken by proper domestic management, as withholding any excess of fluids before going to bed, by waking it and making it empty the bladder late at night. The most certain medicinal remedy is belladonna. But many different sources of irritation may be operative, and these must be sought for and eliminated. Among the more common are worms, enlarged tonsils, and adenoid growths (which produce a semiasphyxiated condition during sleep), and phimosis. Enuresis is seen in some cases of cerebral or spinal disease, when it is of a different nature. In these patients the bladder becomes filled, and subsequently formed urine dribbles away, owing to a failure in the nerve mechanism to cause contraction of the muscle fibres in the wall of the viscus.

URINE, RETENTION OF. See RETENTION OF URINE; STRANGURY.

URIU, ōō'rĭ-ōō, SOTOKICHI, BARON (1857–). A Japanese admiral, born in Ishikawaken. He graduated from a Japanese naval academy, and in 1881 from the United States Naval Academy at Annapolis. Afterward he was promoted through the various grades to captain (1892), rear admiral (1900), and vice admiral (1904) in the Japanese navy. During the China-Japan War he was naval attaché at Paris. Later he served as captain of the *Matsushima*, and then of the *Yashima*. During the Russo-Japanese War he commanded the Second squadron, blockaded the port of Chemulpo, and there sank the Russian cruisers *Variag* and *Korties*. For his war services he was decorated with the first class of the Rising Sun and the second class of the Golden Kite in 1906, and created Baron in 1907.

UR′IYA (or ORIYĀ) **LANGUAGE AND LITERATURE** (Skt. *Odra*, *Utkali*). The language and literature of Orissa (q.v.), in Bengal, spoken by about 9,000,000 persons. Together with Bengali (q.v.), Bihari (q.v.), and Assamese (see ASSAM), it forms the eastern group of the Indo-Aryan family of languages. Like the other modern Aryan languages of India, it is analytic in structure. In grammatical construction Uriya is related to Bengali, although it resembles Hindi. (See HINDUSTANI LANGUAGE AND LITERATURE.) Its resemblance to Bengali consists in the fact that the plural is signified by a noun meaning multitude, and that the first and second persons singular of the verb are used only by the uneducated. But it differs from Bengali in that its spelling is much more phonetic, and that it possesses a very complete set of verbal nouns, present, past, and future. In grammatical development as well as vocabulary Uriya is very archaic and can only be compared to Vedic. The vocabulary, however, is largely composed of Sanskrit loan words, of which Uriya possesses more than any other of its kindred languages. The standard dialect is that of Cuttack. The script, which is derived from the Devanagari (q.v.), is noteworthy among the North Indian alphabets in that it is characterized by curves instead of angles. Uriya literature, which is rather scanty, cannot be traced beyond the sixteenth century. It begins with Upendra-Bhanja, the author of more than 30 poems, most of them religious or erotic, although he also wrote two dictionaries. Contemporary with him was Dina-Krushna Dasa, who composed the most famous Uriya poem, the obscene *Rasakallōla* (edited at Cuttack, 1897). Most of the literature, however, consists of translations or paraphrases of Sanskrit works, such as the *Rāmāyaṇa* (q.v.), the *Bhagavadgītā* (q.v.), and some of the *Purāṇas* (q.v.), while in later times the tendency has been to translate or adapt Bengali and English books. Its modern prose works are, therefore, of rather doubtful value.

Bibliography. Beames, *Comparative Grammar of the Modern Aryan Languages of India* (3 vols., London, 1872–79); Cust, *Modern Languages of the East Indies* (ib., 1878); Hallam, *Oriya Grammar for English Students* (Calcutta, 1874); Maltby, *Practical Handbook of the Uriya Language* (ib., 1874); Jagannath Rao, *Utkal Abhidhán: A Dictionary of the Uriya Language* (Cuttack, 1891); Chakravarti, "Notes on the Language and Literature of Orissa," in the *Journal of the Royal Asiatic Society, Bengal Branch*, vols. lxvi–lxvii (Calcutta, 1900); Grierson, "Indo-Aryan Family: Eastern Group," in the *Linguistic Survey of India*, vol. v, part ii (ib., 1903).

URLICHS, o͞or′lĭks, LUDWIG VON (1813–89). A German classical scholar, born in Osnabrück and educated at Bonn. He taught at Bonn from 1844 to 1847, was then called to Greifswald and in 1855 to Würzburg. He wrote on the history of art, *Skopas' Leben und Werke* (1863), *Die Anfänge der griechischen Künstlergeschichte* (1871–72), and *Beiträge zur Kunstgeschichte* (1885); and on Tacitus and Pliny. His "Grundlegung und Geschichte der klassischen Altertumswissenschaft" (1886; 2d ed., 1892), in Iwan Müller's *Handbuch der klassischen Altertumswissenschaft*, is his most important work in classical philology.

URLUS, ụr′lụs, JACQUES (1873–). A German dramatic tenor, born at Hergenrath, near Aix-la-Chapelle. He began his musical studies at Utrecht, and continued them at Amsterdam under Averkamp and Nolthenius and at the conservatory. His début took place in 1894 at the Opera in Amsterdam, where he remained for six years. Engaged for the Leipzig Opera, in 1900, he created so deep an impression there that he was asked to participate in the Wagner festivals at Bayreuth and Munich. His superb interpretation of the great Wagner rôles secured him many guest appearances at Berlin, Vienna, Paris, Amsterdam, and Brussels. In 1912, when he made his American début at Boston as Tristan, he won instant success, and from 1913 he was a regular member of the Metropolitan Opera House. His beautiful singing and noble acting established him as an operatic favorite.

URMIA, o͞or-mē′ȧ. A lake and city of Persia. See URUMIAH.

UROCHORDA, ū′rō-kôr′dȧ (Neo-Lat. nom. pl., from Gk. *οὐρά*, *oura*, tail + *χορδή*, *chordē*, chord). A class of chordate animals, the ascidians (q.v.).

U′RODE′LA (Neo-Lat. nom. pl., from Gk. *οὐρά*, *oura*, tail + *δῆλος*, *dēlos*, manifest). An order of the Amphibia which comprises the tailed amphibians, or amphiumes, salamanders, and mud puppies (qq.v.), in which both fore and hind limbs are always present, and which have teeth in both jaws; and the sirens, in which the hind limbs, maxillary bones, teeth, and eyelids are absent. This order is confined to the north temperate zone, except a few forms that extend along the highlands into Venezuela. About 100 species in four families constitute the entire list. These families are the Salamandridæ, Amphiermidæ, Proteidæ, and Sirenidæ. The geological origin of the group is uncertain; representatives are numerous in the Lower Tertiary strata; and a single Mesozoic specimen is known. Consult Hans Gadow, "Amphibia and Reptiles," in *Cambridge Natural History*, vol. viii (London, 1901), and E. G. Boulanger, *Reptiles and Batrachians* (New York, 1914).

UROT′ROPIN. One of several trade names of a formaldehyde derivative called hexamethylenamin, having the formula $C_6H_{12}N_4$. It is produced by the action of formaldehyde on ammonia and is a valuable internal antiseptic, particularly on the urinary organs, being decomposed in the tissues, the formaldehyde being set free and excreted by the kidneys. If urotropin is given in sufficiently large doses formaldehyde can be detected in the cerebrospinal fluid and other secretions of the body. The indications for its use are, therefore, infections of the kidneys, bladder, and urethra, such as pyelitis, cystitis, and urethritis. It is also advocated as a prophylactic against meningitis and scarlatinal nephritis, and is of value in diarrhœa and as a solvent of uric acid. In cases of early cerebrospinal meningitis it may be injected directly into the spinal canal. Certain individuals have an idiosyncrasy against the drug, and in them symptoms of severe renal irritation may arise. Other trade names of hexamethylenamin are cystogen, formin, aminoform, and uritone.

URQUHART, ẽr′kẽrt, David (1805–77). A British diplomat and political writer. He was born in Scotland, and was educated at St. John's College, Oxford. He took part in the Greek war of independence. In 1835–36 he was Secretary of the British Embassy at Constantinople. Because of opposition to the Eastern policy of Lord Palmerston, whom he suspected of collusion with the Czar, he resigned his position. After traveling in all parts of the East to obtain further information respecting the commercial and political influence of Russia, he returned to England, and both in his writings and in Parliament (1847–52) openly charged the Palmerston ministry with betrayal of British interests. His publications include: *Turkey and Its Resources* (1833); *The Spirit of the East* (1838); *The Mystery of the Danube* (1844); *Letters and Essays on Russian Aggressions* (1853); and other books bearing on the Eastern Question.

URQUHART, or **URCHARD**, Sir Thomas (1611–60). An English author. He belonged to an ancient family of Cromarty in Scotland. He was educated at King's College, Aberdeen, and traveled in France, Spain, and Italy. He was on the Royalist side in the Revolution; was knighted by Charles I in 1641; and fought at the battle of Worcester. He was taken prisoner and was imprisoned in the Tower and then in Windsor Castle, but was soon released on parole. Of his last years little is known. He is said to have died abroad in an uncontrollable fit of laughter on the restoration of Charles II. He is still known for his excellent translation of Rabelais (two books of *Gargantua* in two vols., 1653; reissued, with a third translated book by Urquhart and with the rest rendered by P. A. Motteux in Bohn's Library, London, 1897, and in *Tudor Translations Series*, London, 1899). Of great interest is his poem *The Jewel*, in which is described a universal language (1652), a kind of forbear of Volapük, which he himself had concocted. In his *Promptuary of Time* (1652) he traced his family back to the red earth from which God created Adam. He also published *Epigrams, Divine and Moral* (1641); *The Trissotetras; or a most Exquisite Table for Resolving all Manner of Triangles* (1645); and other curious books.

URQUIZA, o͞or-kē′thȧ, Justo José (1800–70). An Argentine soldier and politician, born at Arroyo de la China, Entre Ríos. He was educated by the Jesuits and attained great prominence in his native province as an adherent of the Federal party. In 1844–45 he fought with sanguinary distinction in Uruguay. He was early a supporter of J. M. Rosas (q.v.), and in 1846 was elected Governor of Entre Ríos. When Rosas tried to destroy the autonomy of the Argentine states Urquiza revolted, formed an alliance with Brazil and Uruguay, and, entering the latter country in June, forced Oribe, the general of Rosas, to capitulate. Urquiza then crossed into Buenos Aires, and at Monte Caseros, Feb. 3, 1852, defeated Rosas, who was compelled to flee. After the formation of the new constitution in 1853 he was elected President of the Argentine Confederation, which included all the states excepting Buenos Aires, and by his victory at Cepeda, Oct. 23, 1859, forced that state, too, to lend its adhesion. His term of office ended in the same year. Soon afterward Buenos Aires revolted, and Urquiza, at the head of the forces of the confederation, was defeated by Gen. Bartolomé Mitre (q.v.) at Pavón, Sept. 17, 1861. Urquiza was later again Governor of Entre Ríos and served as general in the early part of the Paraguayan War. He was assassinated by political enemies on his estate at San José, near Concepción.

UR′SA MA′JOR (Lat., greater bear) and **UR′SA MI′NOR** (Lat., lesser bear). Two celebrated constellations in the Northern Hemisphere of the heavens. Ursa Major was distinguished as early as the time of Homer by the names *Arktos*, the Bear, and *Hamaxa*, the Wagon. The Roman name *Ursa* was a translation of the Greek *Arktos;* the Romans also called the seven bright stars the *Septentriones*, the seven plowing oxen. The common names throughout Europe for these seven stars are the Plow, Charles's Wain, the Wagon, evidently derived from the classical epithets above mentioned; in America they are called the Dipper, from the resemblance to that utensil. This remarkable group of stars, being within 40° of the North Pole, never sinks below the horizon in northern latitudes higher than 40°. The constellation contains a considerable number of stars visible to the naked eye; there is, however, none of the first magnitude, but at least 16 are of the third magnitude or brighter. Of the seven stars constituting the Dipper, six, viz., α, β, γ, ϵ, ζ, and η, are of second magnitude, while the seventh, δ, is of the third magnitude; α and β are known as the Pointers, because a line drawn through them points directly at the polestar (q.v.). ζ Ursæ Majoris, or Mizar, was the first star to be recognized as double, its two components, of magnitudes 2.4 and 4 respectively, being separated by about 14.6″; in 1889 Pickering found that the brighter component was itself a spectroscopic binary.

Ursa Minor is less prominent in the heavens. The star α in the extremity of the tail of the Little Bear, at present the polestar (q.v.), is the brightest in the constellation, though only of the second magnitude.

URSEREN, ụr′ze-rẹn. See Andermatt.

UR′SIDÆ. The family of the bears (q.v.).

URSI′NUS, *Ger. pron.* o͞or-sē′nụs (Latinized form of his German name Bär), Zacharias (1534–83). A Reformed church theologian. He was born at Breslau, and studied at Wittenberg under Melanchthon, at Geneva under Calvin, and at Paris. He became professor at Heidelberg (1561) and teacher at Neustadt-on-the-Hardt in 1578. With Olevianus he drew up the Heidelberg Catechism, and wrote in its defense. His collected works appeared at Heidelberg in 3 vols. (1612 et seq.). Consult Sudhoff, *Olevianus und Ursinus* (Elberfeld, 1857).

URSO, ụr′sō′, Camilla (1842–1902). A French violinist, born at Nantes, France. She studied with Massart in Paris, and, about 1852, played in New York, Boston, Philadelphia, and other American cities. She was exceedingly successful, especially in concerts with Alboni and Sontag. She returned to France after having toured Canada, and in 1866 again visited New York. Subsequently she made tours of Australia and South Africa. After 1895 she lived in New York.

URSUA, o͞or-so͞o′ȧ, or **ORSUA**, Pedro (c.1510–61). A Spanish soldier and explorer, born in Ursua, near Pamplona, Navarre. About 1544 he went to New Granada, where he became Governor in 1545, and in 1547 and again in 1549 marched to the northeast in search of Eldorado, making several settlements, among them Pamplona. In 1559 he was sent by the Viceroy of Peru to search again for Eldorado or the Kingdom of the Omaguas, on the Peruvian tributaries of the Amazon. This expedition seems to have been sent in order to rid Peru of the many soldiers of fortune, who were eager to enlist. One of them, Lope de Aguirre (q.v.), after the expedition had sailed down the Huallaga, formed a conspiracy, the outcome of which was the assassination of Ursua.

UR′SULA, Saint. A saint and martyr of the Roman Catholic church. She is held in especial reverence at Cologne, the reputed place of her martyrdom. October 21 is her day in the church's calendar, and the date of her martyrdom is variously given as 237, 283, and 451. The official date, however, is 237.

The legend appears in various forms, but the common element seems to be that Ursula was the daughter of a British King, and that her hand was asked by another King for his son, who threatened to lay waste the land if he were refused. But Ursula had been vowed to virginity. At last she succeeded in gaining three years' delay, during which time she was to visit various holy places in company with 11,000 virgins. They took ship and sailed up the Rhine to Basel, and thence went to Rome on foot. They returned and sailed down the Rhine again as far as Cologne, where they were massacred one and all by the Huns. They were buried by the inhabitants of Cologne with great honors, and a church was built over their remains.

The legend is entirely unknown to Jerome, Bede, Rabanus Maurus, and Gregory of Tours, though the latter gives a detailed description of the church. The earliest traces of the legend appear in the ninth century, and in the succeeding centuries, references to it become common. Great interest was excited in the twelfth century by the discovery of an old Roman cemetery in Cologne, whose bones were thought to be those of the slaughtered virgins. The vision of an ecstatic nun, St. Elizabeth of Schönau, and of a monk, Hermann Joseph, purported to reconstruct forgotten details of the voyage and death of the martyrs and thus added considerably to the legend.

The controversy over this legend has continued for many hundred years. The conservative element in the Roman Catholic church considers it probable that there was at one time a massacre of virgins at Cologne by the Huns, but that the details of the story as given at the present time are mediæval fabrications. The rationalists outside of the church follow Schade's theory that the story of Ursula is only a Christianizing of an old German myth, and that Ursula is really Freya, called in Swabia Hörsel, or Ursul, with the same attributes as the moon divinities in other lands.

Consult: Crombach, *Vita et Martyrium Sanctæ Ursulæ et Sociarum* (Cologne, 1547); Schade, *Die Sage von der heiligen Ursule und den elftausend Jungfrauen* (Hanover, 1854); G. F. Tout, "Legend of St. Ursula," in *Historical Essays*, by various authors (London, 1902). For controversial replies to Schade: De Buck, *Acta Sanctorum* (Brussels, 1858); Kessel, *Ursula und ihre Gesellschaft* (Cologne, 1863).

UR′SULINES. A religious order for women in the Roman Catholic church, founded for the education of girls. It takes its origin from St. Angela Merici (q.v.). A rule in 25 chapters was projected by Angela, and finally approved (1536) by the Bishop of Brescia, Cardinal Francis Cornaro. Angela was herself chosen as the first superior, in the year 1537, the community even at that time numbering as many as 76 sisters. In the year 1565 a house was opened at Cremona; and with the approval of Popes Gregory XIII and Clement VIII, it spread over many dioceses of Italy. It was warmly encouraged by St. Charles Borromeo, and at his death there were no fewer than 18 convents of the order in his diocese, comprising above 600 nuns. Soon afterward it was established in France (1584). They were introduced into Savoy by St. Francis de Sales in 1635; and in 1639 a convent was opened in Quebec. They were introduced into Vienna, in 1660, and into Freiburg, Kitzingen, and Prague soon afterward, where they have continued to teach with great success. They now number 300 convents and 7000 nuns and are found in all parts of the world. The Ursuline Sisters have several educational establishments in Ireland, in England, Scotland, Canada, and in 1916 had 24 in the United States, with 1665 sisters and more than 15,000 pupils. Consult: Sainte-Foi, *Annales de l'ordre de Sainte Ursule* (Clermont-Ferrand, 1858); *Les Ursulines de Québec* (Quebec, 1868); *Glimpses of the Monastery* (ib., 1897); Pohtel, *Histoire de Sainte Angele Merici et de tout l'ordre des Ursulines* (Paris, 1878).

UR′TICA′CEÆ (Neo-Lat. nom. pl., from Lat. *urtica*, nettle, from *urere*, Skt. *uṣ*, to burn). A dicotyledonous family known as the nettle family, comprising about 40 genera and 550 species of wide geographic distribution, and chiefly herbs. The representative genera in the North American flora are *Urtica* (nettle), *Pilea* (richweed), *Boehmeria* (false nettle), and *Parietaria* (pellitory).

UR′TICA′RIA (Neo-Lat., from Lat. *urtica*, nettle), Hives, or Nettle Rash. An eruption of the skin, coming out suddenly, and consisting of firm, round, convex, or lenticular elevations of the skin, from ¼ inch to an inch in diameter, at first pink, and soon becoming white in the centre. These are called pomphi or wheals. They are scattered or closely crowded over the part affected, and are not symmetrical. In some cases the wheals are as large as an egg, this condition being termed giant urticaria. In the acute form of the disorder the wheals arise rapidly and subside in a few hours or a day at longest. In the rarer, chronic form they last longer and recur frequently. Urticaria is accompanied by intense itching.

The causes may be both local and general. Among the local causes are direct irritants such as the poison of the stinging nettle (whence the name), the stings of bees and wasps, contact with jellyfish and certain caterpillars. General or systemic causes may be the eating of shellfish, pork, sausages, mushrooms, and some fruits, such as strawberries; certain drugs, as copaiba, cubebs, quinine; the injection of antitoxin or other serums; general disorders, such as gout, indigestion, asthma, and in women pregnancy, menstruation, and lactation. Sometimes no cause can be found except general nervous irritability. Treatment must depend on the cause, which should be sought for and removed. Acute cases, of dietetic origin, may be relieved by an emetic, if vomiting and diarrhœa do not occur spontaneously. In the chronic form, which is often very stubborn, if the urticaria can be traced to any article of food, this should be eliminated. The digestion must be regulated, and general disorders, such as gout, treated with appropriate remedies. For the severe itching and burning, alkaline baths or lotions, or mild solutions of carbolic acid or other antiseptics, may be used locally. Scratching must be avoided, since it only aggravates the affection. The pharynx or larynx may be the seat of urticaria and produce alarming attacks of suffocation.

U'RUBITIN'GA (from Braz. *urubu*, vulture + Tupi *tinga*, white, beautiful). A large hawk of the genus *Urubitinga*, several species of which exist in tropical America. All have bluish black plumage, marked with white on the rump and tail. One species, the Mexican black hawk (*Urubitinga anthracina*), may be found in Arizona. These hawks nest in large trees, and lay white eggs.

URUGUAY, ū'rụ-gwä *or* o͞o'ro͞o-gwī'. A river of South America, rising on the west slope of the Brazilian coast range, and emptying into the Plata estuary (Map: America, South, D 5). Its total length is about 1000 miles. The greater part of its course lies on the plateau, and the upper portion, known as the Pelotas, passes through a densely forested wilderness. The banks are generally high as far as Salto, 200 miles from the mouth of the river, and at that point navigation is obstructed by a series of rocky reefs and rapids, which become falls at low water. Below Salto the land on the west bank is low and level, and periodically inundated. The Uruguay here connects by lateral branches with the Paraná. For the last 100 miles the river is very broad, and really forms the head of the Plata estuary, though the name Uruguay is continued to the Paraná confluence. The river is navigable for large sea-going vessels to Paysandú, about 150 miles, and for smaller vessels to Salto, while barges navigate the stream 300 miles above the rapids.

URUGUAY, officially República Oriental del Uruguay. The smallest of the South American republics, bounded on the north and east by Brazil, on the east and south by the Atlantic Ocean, on the south and west by Argentina, from which it is separated by the Uruguay and La Plata rivers. Its area is calculated at 72,168 square miles.

Topography and Minerals. The most elevated portions of Uruguay lie in the north and northwest, where a few sharp ridges attain a height of nearly 2000 feet. Along the Uruguay River are found table-lands of moderate elevation, resembling the neighboring pampas of Argentina, though higher. The southeastern coast portion is low and marshy, with sandy stretches bordering the ocean, while the interior is composed of rolling plains diversified in the north and northwest by low ridges of hills. Here extensive forest regions also occur, especially near the rivers, while the southeastern portion is largely covered with grass. The hills rest upon an old crystalline foundation of gneiss and granite, with some sandstone, Tertiary and ancient eruptive rocks, and possibly Paleozoic strata. The maritime and river coast of Uruguay from Chuy to Santa Rosa is 685 miles long. After the Río de la Plata and the Uruguay the Río Negro, wholly within the Republic, is the most important river and for a portion of its course is navigable for small craft. But little advantage has been taken of the mineral wealth, though it is certain that silver, copper, magnesium, iron, zinc, lead, gypsum, sulphur, asbestos, antimony, and coal exist. Gold mines are worked in the northern departments. Precious stones, including diamonds, rubies, jasper, agate, amethyst, and topaz, are found. Marble and other building-stone quarries are in operation.

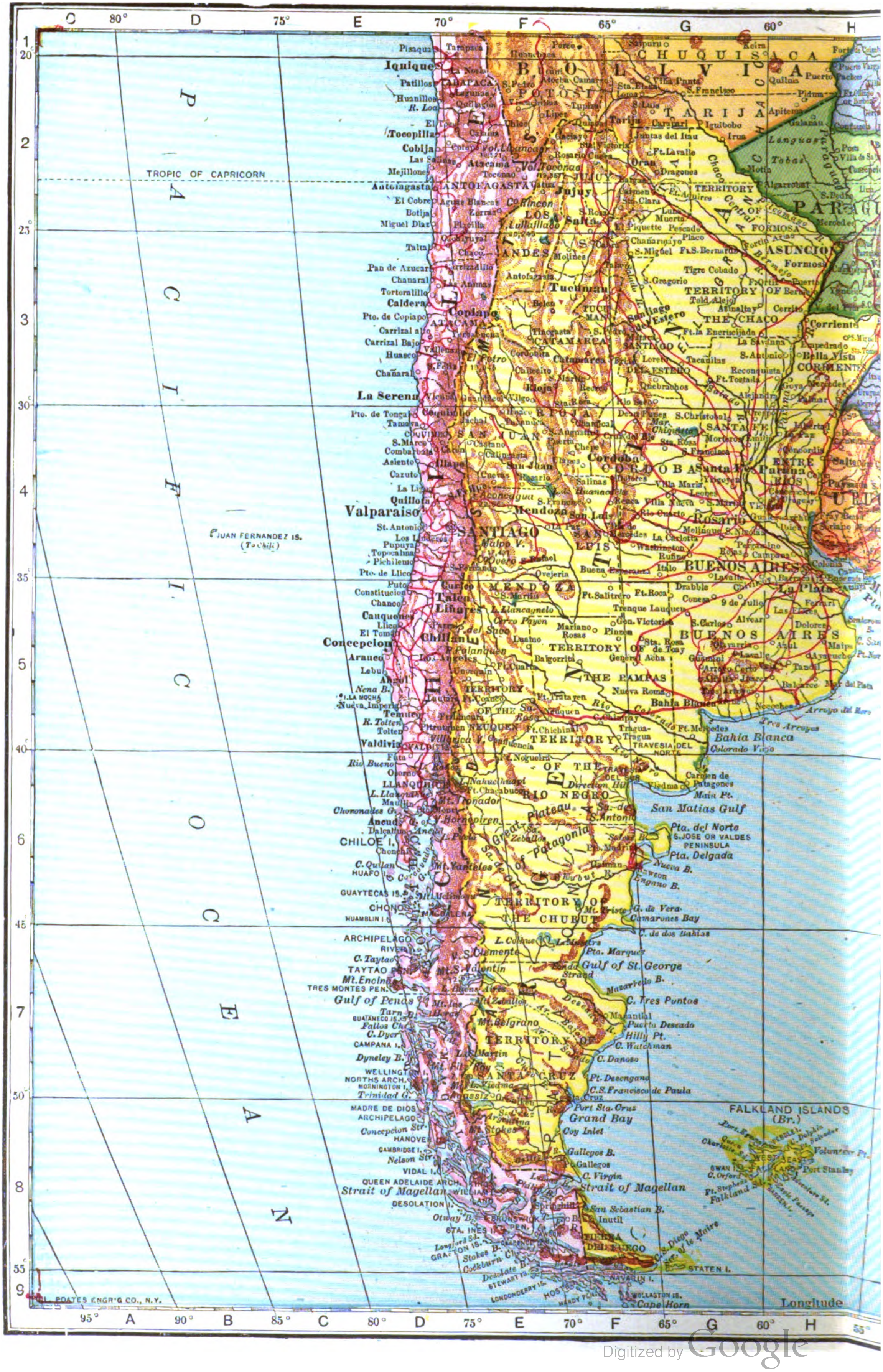
Climate, Flora, and Fauna. The almost peninsular position of Uruguay gives it a delightful climate, with temperature ranging from 32° to 88° F. Occasionally in the lowlands the temperature rises to 100° F. in February, while frosts are common in the upland regions, where occasional snows also occur at long intervals. Rains are plentiful throughout the year, but the greatest precipitation occurs in May and in October. During the winter months cold storms, known as pamperos, blow from the southwest. In its flora and fauna Uruguay in the northern part resembles southern Brazil and in the southern part its neighbor Argentina. See Argentina; Brazil.

Industries. During recent years there has been a steady advance in agricultural production. Public companies facilitate the purchase of land by settlers. Up to 1880 most of the breadstuffs were imported, but since 1885 corn and wheat have become important articles of export. The grazing industries of Uruguay are, however, the chief reliance of the inhabitants. The results of the live-stock census of 1908 were as follows: cattle, 8,192,602; milch cows, 565,854; horses, 566,307; mules, 17,671; asses, 4428; sheep, 26,286,296; goats, 19,951; swine, 180,099; ostriches, 242,872. The increase in the number of cattle between 1900 and 1908 was 20 per cent and of sheep 41.3 per cent. In 1908 the cultivated area was 794,136 hectares; since that date it has probably increased considerably, 1,000,000 hectares being stated unofficially in 1915. Natural meadows and pastures amounted to 15,278,374 hectares in 1908, and woodlands to 433,673 hectares. The following table shows the area in hectares under leading crops in the year 1914–15, with the average area in the period 1910–11 to 1914–15, and the production in metric quintals in 1914–15, with the average production in 1910–11 to 1914–15; the last column shows the average yield per hectare in the period 1910–11 to 1914–15.

CROP	HECTARES		QUINTALS		Qs. ha.
	1914–15	Average	1914–15	Average	
Wheat	315,000	309,990	930,000	1,605,452	5.1
Oats	33,531	27,951	150,890	179,318	6.5
Corn	345,000	264,145	2,920,000	1,807,741	6.1
Barley	1,782	2,465	8,019	15,352	5.9
Linseed	40,000	48,964	140,000	221,234	5.8
Tobacco	....	1,224	....	10,037	8.2
Vines	18,500	16,589	....	*152,934	..

* Hectoliters of wine.

Other crops of importance are potatoes, sweet potatoes, beans, fruits, and olives. The chief manufacture is flour. There are saladeros for


C
80°
D
75°
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G
60°
H
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9
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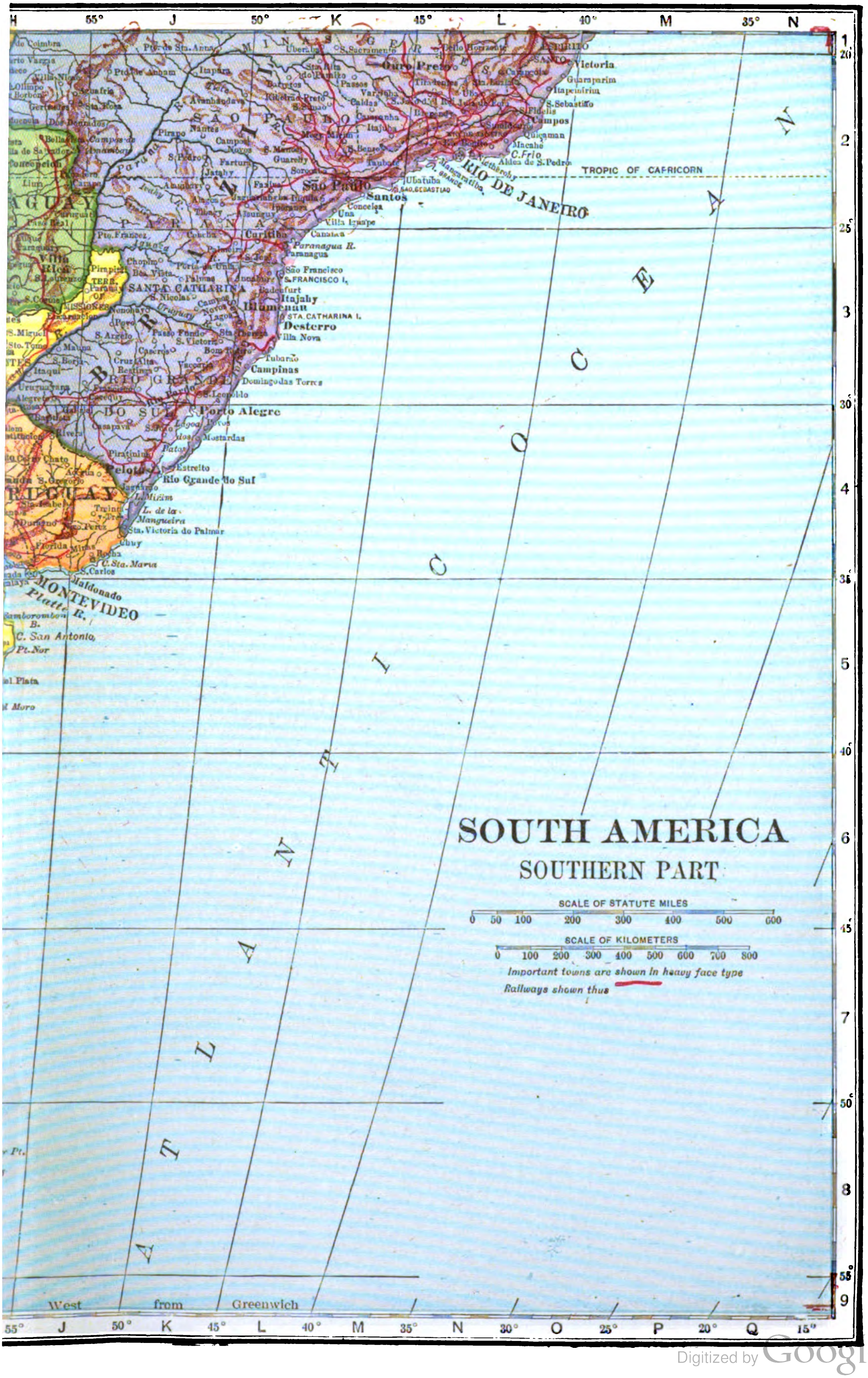
95°
A
90°
B
85°
C
80°
D
75°
E
70°
F
65°
G
60°
H
55°
Longitude
TROPIC OF CAPRICORN
PACIFIC OCEAN
JUAN FERNANDEZ IS.
(To Chili)
BOLIVIA
POTOSI
CHUQUISACA
TARIJA
PARAGUAY
ASUNCION
URUGUAY
CHILI
ARGENTINA
LOS ANDES
TERRITORY OF FORMOSA
TERRITORY OF THE CHACO
JUJUY
SALTA
TUCUMAN
CATAMARCA
SANTIAGO DEL ESTERO
CORRIENTES
SANTA FE
ENTRE RIOS
CORDOBA
SAN LUIS
SAN JUAN
RIOJA
MENDOZA
BUENOS AIRES
TERRITORY OF THE PAMPAS
TERRITORY OF THE NEUQUEN
RIO NEGRO
TERRITORY OF THE CHUBUT
TERRITORY OF SANTA CRUZ
TIERRA DEL FUEGO
PATAGONIA
Great Plateau of Patagonia
TARAPACA
ANTOFAGASTA
ATACAMA
COQUIMBO
SANTIAGO
VALPARAISO
LLANQUIHUE
CHILOE I.
Iquique
Pisaqua
Patillos
Huanillos
R. Loa
Tocopilla
Cobija
Mejillones
Antofagasta
El Cobre
Botija
Miguel Diaz
Taltal
Pan de Azucar
Chanaral
Tortoralillo
Caldera
Copiapo
Pto. de Copiapo
Carrizal alto
Carrizal Bajo
Huasco
La Serena
Pto. de Tongoy
Coquimbo
Combarbala
Illapel
Quillota
Valparaiso
St. Antonio
Pupuya
Topocalma
Pichilemo
Pto. de Llico
Constitucion
Chanco
Cauquenes
Concepcion
Arauco
Lebu
Angol
Nena B.
I. LA MOCHA
Nueva Imperial
Temuco
R. Tolten
Tolten
Valdivia
Rio Bueno
Osorno
L. Llanquihue
Chonos G.
Ancud
Dalcahue
C. Quilan
HUAFO I.
GUAYTECAS IS.
CHONOS
HUAMBLIN I.
ARCHIPELAGO
C. Taytao
TAYTAO PEN.
Mt. Encinas
TRES MONTES PEN.
Gulf of Penas
C. Dyer
CAMPANA I.
Dyneley B.
WELLINGTON I.
NORTHS ARCH.
MORNINGTON I.
Trinidad G.
MADRE DE DIOS ARCHIPELAGO
Concepcion Str.
HANOVER I.
CAMBRIDGE I.
Nelson Str.
VIDAL I.
QUEEN ADELAIDE ARCH.
Strait of Magellan
DESOLATION I.
Otway B.
STA. INES I.
BRUNSWICK PEN.
Stokes B.
CLARENCE I.
GRAFTON IS.
Cockburn Ch.
Desolate B.
STEWART IS.
LONDONDERRY IS.
HOSTE I.
NAVARIN I.
WOLLASTON IS.
Cape Horn
STATEN I.
Str. of le Maire
C. San Diego
Inutil
San Sebastian B.
C. Virgin
Gallegos
Gallegos B.
Coy Inlet
Grand Bay
Port Sta. Cruz
C.S.Francisco de Paula
Pt. Desengano
C. Danoso
C. Watchman
Hilly Pt.
Puerto Deseado
C. Tres Puntas
Mazarredo B.
Gulf of St. George
Pta. Marques
C. de dos Bahias
Camarones Bay
G. de Vera
Engano B.
Nueva B.
Pta. Delgada
S.JOSE OR VALDES PENINSULA
Pta. del Norte
San Matias Gulf
Main Pt.
Carmen de Patagones
Viedma
TRAVESIA DEL NORTE
Colorado Viejo
Bahia Blanca
Tres Arroyos
Arroyo del Moro
Mt. Tronador
Mt. San Valentin
Mt. Belgrano
L. Buenos Aires
L. Viedma
L. Argentina
L. Colhue
Chubut R.
Deseado R.
Chico R.
Sta. Cruz R.
Rio Negro
Rio Colorado
Vol. Llullaillaco
Tucuman
Salta
Jujuy
Oran
Rioja
Catamarca
Cordoba
San Juan
Mendoza
Aconcagua
San Luis
Rosario
Santa Fe
Parana
Corrientes
Bella Vista
Formosa
BUENOS AIRES
La Plata
Colonia
Azul
Tandil
Bahia Blanca
Curico
Talca
Linares
Chillan
Los Angeles
Rio Cuarto
Villa Maria
Mercedes
Dolores
Nueva Roma
Fuerte General Roca
General Acha
FALKLAND ISLANDS (Br.)
Port Stanley
Falkland Sd.
WEST FALKLAND
EAST FALKLAND
Volunteer Pt.
Port Egmont
Pt. Stephens
C. Orford
SWAN IS.
Adventure Sd.
Choiseul Sd.
L. L. POATES ENGR'G CO., N.Y.


SOUTH AMERICA
SOUTHERN PART
SCALE OF STATUTE MILES
0 50 100 200 300 400 500 600
SCALE OF KILOMETERS
0 100 200 300 400 500 600 700 800
Important towns are shown in heavy face type
Railways shown thus
TROPIC OF CAPRICORN
ATLANTIC OCEAN
West from Greenwich
H
J
K
L
M
N
O
P
Q
55°
50°
45°
40°
35°
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45
50
55
MINAS GERAES
ESPIRITO SANTO
SÃO PAULO
PARANÁ
SANTA CATHARINA
RIO GRANDE DO SUL
BRAZIL
PARAGUAY
URUGUAY
Ouro Preto
Bello Horizonte
Victoria
Guarapari
Itapemirim
Campos
S. Fidelis
Macahé
Quiçaman
C. Frio
Aldea de S. Pedro
RIO DE JANEIRO
Mangaratiba
I. Grande
Ubatuba
São Sebastião
São Paulo
Santos
Conceição
Una
Villa Iguape
Cananea
Paranaguá
Paranagua R.
Curitiba
S. José
São Francisco
S. FRANCISCO I.
Itajahy
Blumenau
STA. CATHARINA I.
Desterro
Villa Nova
Tubarão
Campinas
Domingo das Torres
S. Leopoldo
Porto Alegre
Lagoa dos Patos
Mostardas
Estreito
Rio Grande do Sul
Pelotas
Jaguarão
L. Mirim
L. de la Mangueira
Sta. Victoria do Palmar
Chuy
Rocha
C. Sta. Maria
S. Carlos
Maldonado
MONTEVIDEO
Platte R.
Samborombon B.
C. San Antonio
Pt. Nor
del Plata
el Moro
Uberaba
S. Sacramento
Campinas
Sorocaba
Guaratinguetá
Taubaté
Itapetininga
Itapeva
Faxina
Paranapanema
Ponta Grossa
Palmeira
Guarapuava
Lages
Campos Novos
Palmas
Boa Vista
Chopim
Pto. Franco
Villa Rica
Assumpção
Concepción
Encarnación
Missiones
Uruguayana
Alegrete
S. Borja
Itaqui
Cruz Alta
Passo Fundo
Cachoeira
Caçapava
Piratinim
Bagé
S. Gabriel
Rivera
S. Eugenio
Durazno
Florida
Minas
Treinta y Tres
Porto Alegre
Parana R.
Uruguay R.
Tropic of Capricorn

the production of jerked and salted meats for foreign shipment.

Transportation and Commerce. There were reported, for 1914, 1601 miles of railway in operation and 165 miles under construction. The rivers are largely utilized for inland communication, and in addition there are some 2250 miles of national highways and 3100 miles of departmental roads and paths for local traffic. In 1912 the merchant marine included 46 steamers, of 29,962 tons net, and 165 sail, of 27,798 tons net. Montevideo is the chief port and one of the best on the coast. The value of the special foreign trade in merchandise has been as follows, in thousands of pesos gold:

	1907	1909	1910	1911	1912	1913
Imports...	37,471	37,157	40,814	44,798	49,380	52,600
Exports...	34,912	45,109	41,023	44,537	53,042	67,600

The leading imports include foodstuffs, textiles, machinery, ironware, and jute; the exports, preserved meats, hides and horns, tallow, cattle, beef extracts, and agricultural products.

Government. The constitution of Sept. 10, 1829, was published July 18, 1830. The legislative power is vested in the General Assembly, or Congress, consisting of the Senate and the House of Representatives. Senators, 19 in number (one for each department), are elected for six years by indirect vote. Representatives, 90 in number, are elected for three years by direct vote. The executive power is vested in the President, elected for four years by a majority vote of the Senate and House of Representatives in joint session. The President is not eligible for the next succeeding term. He is assisted by a responsible minority of seven members. Each territorial department is administered by an executive, appointed by the President, and a council elected by direct vote. The judiciary is composed of a supreme court, two courts of appeal, and a number of lower courts. Justices of the supreme court are elected by the General Assembly; judges of other courts are appointed by the supreme court. The capital of the Republic is Montevideo (q.v.).

Finance. The standard of value is gold, and the monetary unit is the peso, whose par value is $1.03424. For the fiscal year 1914 the estimated revenue and expenditure were 36,597,360 and 36,516,877 pesos respectively. For the same year customs revenue was estimated at 17,600,000 pesos. Public debt, Dec. 31, 1913: foreign consolidated, 118,487,935 pesos; international, 2,190,500; internal, 15,620,423; total, 136,298,858. Service of the debt in 1913 was 5,366,733 pesos; in addition redemptions amounted to 2,514,013 pesos. The Bank of the Republic, established in 1896, had a nominal capital in 1911 of 20,000,000 pesos; the paid-up capital at the end of 1913 was 13,027,778 pesos. This bank has an exclusive right of issue. Its note circulation in January, 1915, was 23,295,886 pesos, and its stock of gold 11,647,109 pesos.

Army. The regular army is recruited by voluntary enlistment and consisted, in 1915, of 17 battalions and 4 rifle companies of infantry, 16 regiments of cavalry, 3 field artillery regiments of only 3 batteries each, 1 company of fortress artillery, 1 machine gun company, 1 sanitary company. Total peace strength about 10,500; initial mobilization for war estimated at 50,000. Enlistment period from two to five years, with the privilege of reënlistment until the age of 44. In the militia service is compulsory between the ages of 17 and 45, as follows: first class, physically fit, between 17 and 30, numbers about 20,000, takes the field with the regular army in war; second class, physically fit, between 30 and 45, recruited and serving in territorial departments, but available to supply vacancies created in field forces in war; third class, all other men between 19 and 45, not included in first two classes, liable for local home defense only. Total strength of three classes estimated at 170,000 men. For navy, see NAVIES.

Population. By departments the area and the population, according to the census of Oct. 12, 1908, and an estimate of Dec. 31, 1913, are shown in the following table:

DEPARTMENT	Sq. m.	Pop., 1908	Pop., 1913
Artigas	4,393	26,321	36,340
Canelones	1,835	87,874	107,068
Carro Largo	5,764	44,742	54,005
Colonia	2,194	54,644	74,458
Durasno	5,527	42,325	51,787
Flores	1,745	16,082	21,562
Florida	4,675	45,406	56,917
Maldonado	1,587	28,820	37,125
Minas	4,820	51,222	62,920
Montevideo	256	309,231	364,343
Paysandú	5,115	38,421	60,512
Río Negro	3,270	19,932	33,529
Rivera	3,795	35,683	43,342
Rocha	4,281	34,119	43,309
Salto	4,865	46,259	66,493
San José	2,688	46,325	57,011
Soriano	3,561	39,565	51,413
Tacuarembó	8,114	46,939	56,438
Treinta y Tres	3,683	28,777	37,192
Total	72,168	1,042,686	1,315,714

Of the total at the 1908 census, 861,464 (82.62 per cent) were natives, and 180,722 (17.38 per cent) foreigners. The foreigners included 62,357 Italians, 54,885 Brazilians, 18,600 Argentines, 8341 French, 1444 Turks and Syrians, 1406 Swiss, 1324 British, and 1112 Germans. Of the natives, 48.82 per cent were males; of the foreigners, 60.68 per cent. The only large city is Montevideo, which in 1908 had 291,465 inhabitants. The town of Paysandú had 20,953; Salto, 19,788; Mercedes, 15,667; Minas, 13,345; Melo, 12,355; San José, 12,297; Rocha, 12,200.

Education and Religion. In 1908 the population five years of age and over numbered 873,231; of these, illiterates numbered 347,491. Primary instruction is nominally compulsory. In 1913 there were 986 public schools, with an enrollment of 91,746; private schools numbered 238, with an enrollment of 21,874. There are several secondary schools and normal schools, a school of arts and trades, and a military college. At Montevideo is the University of Uruguay, which in 1910 had 112 teachers, 530 regular students, and 661 students receiving secondary instruction. Roman Catholicism is the state religion, but religious toleration prevails. In 1908, of the population 15 years of age and over, 430,095 were Roman Catholic, 12,232 Protestant, 126,425 liberal, and 45,470 other and unspecified.

History. The natives of the Banda Oriental, the region to the northeast of the Plata River, for many years prevented any exploration of the interior and in 1580 forced the garrison to abandon the only fort established in their territory, on the San Salvador River. In 1603 a powerful Spanish force, intended to protect a colony, was defeated, and it was not until the year 1624 that the first settlement which became permanent was founded, at Santo Domingo de Soriano on the Río Negro. The Portuguese of Brazil claimed this region as a part of their territory, and their outposts crept down the coast from Rio de Janeiro, until in 1680 they established themselves at Sacramento, not far distant across the river from Buenos Aires. The local Spanish officials profited by the commerce between this city and the Portuguese, and for 50 years no very serious efforts were made to drive them away. In 1723 the Portuguese fortified the heights surrounding the Bay of Montevideo and apparently planned to enter into more active competition with Buenos Aires. This aroused the Spaniards, who promptly organized an expedition which forced the surrender of the Portuguese works at Montevideo, where a colony of families from Buenos Aires was established. Intermittent conflicts between the two claimants fill the annals of the remainder of the eighteenth century, resulting in the ultimate establishment of the Spanish rule. In 1807 the English fleet under Popham captured Montevideo, but their occupation ended with the failure of the attack on Buenos Aires. The inhabitants of Uruguay promptly joined those of Argentina in the revolt against Spain in 1810 and established an independent confederation under the Protector Artigas (q.v.); the Spaniards were driven from Montevideo in 1814. The country was weakened and demoralized by the efforts to drive out the Spaniards, and the Portuguese in Brazil, perceiving their opportunity, revived their claim to the territory. They captured Montevideo (1817) and drove Artigas into the interior, until he was forced to take refuge in Paraguay. Uruguay was annexed to Brazil as the Cisplatine State. The Uruguayan patriots established headquarters across the Río de la Plata in Buenos Aires, watching for an opportunity to revive the struggle. This came in 1825, when "Thirty-three" patriots under the leadership of Juan Antonio Lavalleja crossed La Plata from Buenos Aires to free Uruguay. The insurgents won several engagements and shut the Portuguese up in their coast strongholds. In February, 1828, the Brazilians were decisively defeated, and in August peace was concluded and the independence of Uruguay was recognized. In 1830 the República Oriental del Uruguay was organized, and for five years the country enjoyed comparative quiet under the presidency of Fructuoso Rivera. In 1835 he was succeeded by Manuel Oribe, and soon a political conflict broke out between the two, terminating in civil war. Rivera made himself the leader of the Gauchos (q.v.) constituting the great mass of the non-Indian population, while Oribe represented the interests of the great landowners. In 1838 Rivera succeeded in overthrowing Oribe, who thereupon turned for aid to Rosas (q.v.), the Dictator of Buenos Aires. With the aid of Argentina's troops Oribe repeatedly defeated his rival, but could not make himself master of Montevideo, which was besieged from 1842 to 1851. In the latter year the party of Rivera concluded an alliance with Brazil, and the State of Entre Ríos, which under Urquiza had broken away from the Argentine Confederation. Oribe was overthrown, and the party of Rivera after a short interval was restored to power. In 1854 Venancio Flores was elected President, but was forced to resign in the following year. There ensued a period of utter disorder marked by conflicts of the Colorado and Blanco parties and close successions of elections and insurrections until in 1864 Brazil intervened to restore order and in the following year brought Flores back to power. An alliance with Brazil and Argentina was concluded in the same year, directed against the Dictator López (q.v.) of Paraguay. This war, which brought ruin upon Paraguay, terminated in 1870. Flores was assassinated early in 1868, and five years later José Ellauri was legally elected President. During his administration many public works were undertaken, and the transatlantic cable laid, with the result that the national finances became complicated.

In May, 1875, Pedro Varela became President, to be succeeded a year later by Colonel Latorre. Numerous changes, at irregular intervals, followed. President Juan Idiarte Borda, a Colorado, who was elected in 1894, was assassinated during a Blanco uprising in 1897 and was succeeded by Juan Lindolfo Cuestas, who in spite of some attempts at revolution retained power till 1903.

José Batlle y Ordóñez, who became President in 1903, had to contend with the opposition of the Blancos, but he succeeded in restoring tranquillity to the Republic before the end of his term. He actively encouraged public works, higher education, and agriculture. In 1907 Claudio Williman entered the presidency. During his administration a boundary treaty was negotiated with Brazil (1907), the supreme court was organized, and a divorce law was passed (1908). A slight revolutionary disturbance occurred in 1910, owing to the candidacy of Batlle; nevertheless he was reëlected and entered his second term on March 1, 1911. During this administration an eight-hour-day bill was passed, child labor was prohibited, the statistical work of the government was organized, economic and social betterment was undertaken, and afforestation and colonization were fostered. During 1914–15 the country passed through a severe financial crisis, which was partially relieved by foreign loans. President Feliciano Viera was inaugurated on March 1, 1915, and announced that he would endeavor to secure constitutional reform, practice economy in the government, create new sources of revenue, foster education, stock raising, and agriculture, and provide for labor legislation. During his first year he secured laws favoring agriculture and colonization and providing rules for prevention of accidents to workingmen.

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Uruguay, in "South American Series" (London, 1911); Orestes Araújo, *Diccionario geográfico del Uruguay* (2d ed., Montevideo, 1912); Pan American Union, *Commerce of Uruguay for 1911* (Washington, 1912); J. A. Hammerton, *The Real Argentine* (New York, 1915).

URUK (Babylonian; Heb. *Erech*). A city in ancient Babylonia on the site of modern Warka, where there are large mounds and numerous ruins. It is mentioned even in the time of Gudea of Lagash. (See BABYLONIA; ERECH.) The German excavations in 1913 revealed that the city was still flourishing in the Seleucid and Arsacid periods. It may have been involved in the revolt of Shamashshumukin (648 B.C.), since, according to Ezra iv. 9, Archevites were carried to Samaria by Asurbanipal. Consult: Loftus, *Travels and Researches in Chaldea and Susiana, with an Account of Excavations at Warka* (London, 1857); R. Zehnpfund, *Babylonien in ihren wichtigsten Ruinenstätten* (Leipzig, 1910); Eduard Meyer, *Geschichte des Altertums* (3d ed., Stuttgart, 1913).

URUMCHI, or **URUMTCHI**, ṳ-rōōm′chê. The capital of the Province of Sinkiang, in Sungaria, China, and the seat of the Chinese administration of eastern Turkestan, 320 miles east of Kulja (Map: China, E 3). It derives its strategic importance from its position on the only road leading from Sungaria to eastern Turkestan which is available for heavy artillery. The population, which is supposed to have been 200,000 at the beginning of the nineteenth century, is estimated at 30,000.

URUMIAH, o͞o′ro͞o-mē′yȧ, **OROOMIAH**, or **URMIA**. A city of Persian Armenia (included in the Province of Azerbaijan), 70 miles southwest of Tabriz and 10 miles west of Lake Urumiah (Map: Persia, A 4). It lies amid attractive mountain scenery. The American, French, and Russian missions have headquarters here, and have founded several institutions, including Urmia College, a college for Nestorian priests and deacons, and Fiske Seminary. The district produces fruit, cotton, and tobacco, and there are important dyeing and weaving interests. Pop., estimated at from 30,000 to 35,000. In 1915 the majority of the Armenian inhabitants were massacred by invading Turkish troops. Urumiah is reputed to be the birthplace of Zoroaster. It was for a long time the pilgrimage city of his followers.

URUMIAH, LAKE. The largest lake in Persia, situated in the northwest corner of the country, 170 miles west of the Caspian Sea (Map: Persia, A 4). It is about 80 miles long, with an average breadth of 20 miles, and occupies part of a level basin inclosed by mountains and lying at an altitude of over 4000 feet. The lake is fed by radial streams of considerable size, but it has no outlet. It is consequently very saline, too salt to nourish any life but certain crustaceans; the lake has been shrinking for years, exposing wide tracts of sour slime. It is very shallow, the mean depth being 6 feet, and the maximum about 40 feet. The surrounding region is very fertile, and is covered with vineyards, orchards, and gardens.

URUNGU. A river in Siberia. See IRTYSH.

U′RUS (Lat. *urus*, Gk. *οὖρος*, *ouros*, wild ox, from OHG., AS. *ūr*, Ger. *Auer-ochs*, whence the English *aurochs*, designating a different animal, the European bison; connected with Skt. *usra*, steer, reddish). A wild ox (*Bos primigenius*) which anciently inhabited the forests of central Europe, and is described by Cæsar as common in the Hercynian Forest, and of great size, swiftness, and fierceness. The probability is that the urus was the wild original of the domestic ox, by way of the small or long-fronted ox (*Bos longifrons*), which was the earliest known domesticated ox in Europe. The urus survived in Germany until the twelfth century, and is sometimes wrongly identified with the aurochs (q.v., under BISON).

URVILLE, JULES SÉBASTIEN CÉSAR DUMONT D'. See DUMONT D'URVILLE, J. S. C.

URY, ADOLFO MÜLLER-. See MÜLLER-URY, ADOLFO.

US′BEGS. A people of Russian Turkestan. See UZBEKS.

USE. This expression was used to describe a trust created under the early English practice. (See USES; TRUST.) One of the methods of avoiding the effect of the Statute of Uses (27 Hen. VIII, c. 10) was by making a conveyance to A to the use of B to the use of C. The statute executed the first use, and the property was accordingly held in trust for C.

USE, SHIFTING. See SHIFTING USE.

USE, SPRINGING. See SPRINGING USE.

USE AND OCCUPATION. In law, a phrase employed to denote the beneficial enjoyment of real estate by a person with the owner's consent, but without any definite or enforceable agreement as to the amount of rent to be paid. The landlord is entitled to recover a reasonable sum as compensation for the use and occupation of the premises. See LANDLORD AND TENANT; and consult the authorities there referred to.

USEDOM, o͞o′*ze*-dôm. An island belonging to the Province of Pomerania, Prussia, situated at the mouth of the Oder River (Map: Germany, F 1). Together with the island of Wollin, it separates the Stettiner Haff from the Baltic Sea. It is divided from the mainland on the west by the outlet of the Peene River. Length, 33 miles; area, 158 square miles. It is extremely irregular in shape. It is level and generally fertile save for some sand dunes. Its farm lands and forests are productive. Fishing and commerce also engage the attention of its inhabitants, who number about 35,000. In summer the sea baths attract a large number of visitors. Swinemünde is the principal town.

USE INHERITANCE. The Lamarckian principle of the transmission by heredity of characters acquired during the lifetime of the individual; they are contrasted with congenital characters. That slight lesions are not transmitted was apparently proved by the experiments of Weismann in docking the tails of white mice for 19 generations, and his finding that such a mutilation was not transmitted. At the present time the alleged transmission of mutilations or various lesions, as tattooing or flattening of the head, is not proved. On the other hand, the Lamarckian principle of the inheritance of characters formed by adaptation to changes in the physical environment, changes of climate, as well as those resulting from use or disuse, or any kind of external stimulus, although denied by Weismann and his followers, have not been disproved. Adaptation to a different medium from that of their ancestors, as in the case of birds and insects, is the result of use inheritance. Very obvious examples are the cetaceans where, by change from terrestrial to aquatic habits, the legs have been converted into finlike members. Another instance is the acquired habit of pointing in the pointer breed, cases being known of young dogs pointing without having been trained. The habit of holding the tail erect is an acquired one in dogs, as the wolf and fox never elevate the tail. The senile expression of the face in children of old parents is claimed to be an example of such inheritance. Such examples as these prove that, as Eimer states, every character formed by the functional activity of the animal is an acquired character. The changes begin during the lifetime of the individual, become transmitted (or at least the tendency), until after a number of generations, the new conditions becoming permanent, the new characters are formed, and these are preserved by use inheritance.

The experimental proofs of use inheritance have accumulated sufficiently to prove that, where the changed climate, or temperature and moisture or dryness of the air, remain the same, the new characters are transmitted. In plants, where use and disuse do not come into play, the changes of station, of climate, temperature, soil, and nutrition, when permanent, result in the formation of new varieties and species, according to the Lamarckian principle. It is maintained that the transmission of acquired characters, structural, physiological, and mental, is demanded by the theory of evolution. Weismann's objection to use inheritance is that modifications of the animal are acquired anew in every individual life and cannot be transmitted. It remains to be seen whether this criticism will withstand the mass of data now being accumulated. Consult: Lamarck, *Zoölogical Philosophy*, English translation by Hugh Elliot (London, 1914); also the writings of Darwin, Koelliker, Eimer, Cope, Herbert Spencer, Galton, Hyatt, Weismann, Standfuss, Fischer, Packard, Piepers, Kidd, and others. See EVOLUTION; HEREDITY.

USENER, ōō′*ze*-nẽr, HERMANN (1834–1905). A German classical scholar, born at Weilburg-on-the-Lahn. He became professor at the University of Bonn in 1866. His work covered many fields, both literary and philosophical. Especially important are his studies in the history of religion. His published works include *Anecdoton Holderi* (1877), *Altgriechischer Versbau* (1887), *Epicurea* (1887), *Dionysius Halicarnensis de Imitatione, etc.* (1899), *Dionysii Ars Rhetorica* (1895), *Dionysii Opuscula* (ed. with Radermacher, vol. 1, 1899), *Religionsgeschichtliche Untersuchungen* (1888), *Götternamen* (1896), *Sintflutsagen* (1899); *Vorträge und Aufsätze* (1907). Since his death two volumes of his *Kleine Schriften* have appeared (Leipzig, 1913). Consult J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

U′SERTE′SEN. The name of three kings of Egypt of the twelfth dynasty.—USERTESEN I, the *Σεσόγχωσις* of Manetho, was the son and successor of Amenemhat I (q.v.), the founder of the dynasty. His reign of 44 years began about 1976 B.C., but for the first 10 years he ruled as Coregent with his father, and for the last two years of his life his son, Amenemhat II, was associated with him on the throne. According to a leather roll, written in the time of Amenophis IV, the temple of the sun at Heliopolis was rebuilt in the early part of Usertesen's reign. One of the two granite obelisks erected by Usertesen before this temple is still standing; it is 66 feet in height and is the oldest obelisk in Egypt. (See OBELISK.) At Tanis three finely executed granite statues of the King have been found. A stele was discovered by Champollion at Wadi Halfa, near the second cataract of the Nile, containing a list of 11 Nubian tribes conquered by Usertesen, and an inscription at Beni Hassan records an expedition to Nubia in the King's forty-third year. The remains of Usertesen's pyramid tomb are still to be seen at Lisht, about 30 miles south of Cairo.—USERTESEN II, the fourth King of the dynasty, was the son of Amenemhat II, and the grandson of Usertesen I. He reigned from about 1896 B.C., being for a short time Coregent with his father. A painting in a tomb at Beni Hassan, which depicts a number of Asiatics visiting the Nomarch Chnumhotep in the sixth year of Usertesen II, has been supposed to represent the arrival in Egypt of Abraham or of the sons of Jacob, but there is no evidence in support of either theory, and both are equally improbable. Statues of Usertesen II and of his Queen Nofret were found at Hieraconpolis and at Tanis respectively. The pyramid tomb of the King is at Illahun. Manetho calls this King Sesostris and ascribes to him the conquest of the world, but there is no evidence that Usertesen II ever conducted any foreign wars. (See SESOSTRIS.)—USERTESEN III, the son and successor of Usertesen II, reigned for at least 26 years from about 1883 B.C. His chief energies were directed to the subjugation of Nubia; and to protect the southern frontier of his Kingdom, he built two strong forts at Semneh and Kummeh, about 40 miles south of the second cataract of the Nile. Near Semneh the King set up, in the eighth year of his reign, a boundary stone with the injunction that no negro should pass it except such as came into Egypt for the purpose of peaceful traffic. He was, however, compelled to undertake two subsequent expeditions against the Nubians in the sixteenth and nineteenth years of his reign, before the country was finally subdued. Usertesen III built a temple at Heracleopolis (q.v.) in his fourteenth regnal year. His tomb is probably the more northerly of the two brick pyramids at Dahshur known as the Black Pyramids. Consult: K. A. Wiedemann, *Aegyptische Geschichte* (Gotha, 1884–88); W. M. Flinders Petrie, *A History of Egypt* (New York, 1899); E. A. T. Wallis Budge, *A History of Egypt* (ib., 1902); J. H. Breasted, *A History of the Ancient Egyptians* (ib., 1908). Consult Sesostris, *Ancient Records of Egypt* (Chicago, 1907).

USES. A technical term employed to denote equitable rights to the benefits and profits of real estate, the legal title to which is in a person other than the beneficiary of the "use." The introduction of the doctrine of uses was the result of the attempts of the English clergy to evade the effects of the Statutes of Mortmain, and to enjoy the gifts of the pious. To do this, land was conveyed to a third person, with the understanding or an express declaration that it was to be held to the use of the religious person or corporation intended to be the real donee. When this practice was first introduced, this obligation could only be enforced by threats of excommunication from the Church. Afterward the Chancellor, who was usually appointed from the clergy, assumed jurisdiction over such conveyances, and employed the power of the courts of equity to enforce the use. This effect of such conveyances aroused the hostility of the King and great lords of the realm, which culminated in the enactment of the famous Statute of 27 Hen. VIII, c. 10, commonly known as the Statute of Uses. This act provided, in effect, that where a conveyance was made under the circumstances above described, the beneficiary should receive the legal estate as well as the right to the profits, etc., and also be liable to the lord for the feudal duties. The statute only temporarily accomplished its purpose, as the courts of equity speedily evolved the law of "trusts," which were practically the same as "uses," but under a different name. However, the statute had the important effect of making possible the creation of legal estates to begin in the future without making them legal remainders. The system of conveyancing made possible by the Statute of Uses was finally superseded by the practice of transferring property by deeds of "bargain and sale." The law of uses, as modified by the Statute of Uses, became a part of the common law of the United States, and still obtains in many States, but has been expressly abolished in a few jurisdictions, including New York. See TRUST, and the authorities there referred to; see also REAL PROPERTY.

USHAK, ōō-shäk′. A town of the Vilayet of Brusa, Asia Minor, Turkey, 125 miles east-northeast of Smyrna. It is noted for its carpet manufactures, and it is the centre of a rich agricultural district. Pop., about 14,000.

USHANT, ŭsh′ant. An island in the Atlantic Ocean, belonging to the Department of Finistère, France, 13 miles west of the northwest end of Brittany (Map: France, N., A 4). To the French it is known as the Isle d'Ouessant. Area, 6 square miles. The shores are rocky. Ushant has modern fortifications, and is used for military purposes. Naval battles between ships of the French and English occurred off the island in 1779 and 1794. Pop., 1901, 2717; 1911, 2568.

USHAS, ụsh′ȧs (from Skt. *vas*, *us*, to burn; connected with Gk. Ἠώς, *Eōs*, Lat. *Aurora*, Lith. *auszrà*, dawn, and ultimately with Eng. *east*). In Vedic India, the goddess of dawn. The Rig-Veda devotes 20 hymns to her as the divine personification of the morning light. The fiery steeds or ruddy cows that draw her shining car represent clouds and beams of light that issue from the stall of darkness as she throws open the portals of day. Born each day, and therefore ever young, she reminds mankind of the transitoriness of human life, and by her return day after day she stands as a symbol of the divine order in heaven. The sky is her father; night is her sister; the sun, Surya (q.v.), her lover and spouse; and the twin Asvins (q.v.) are her kin. The sacrificial fire kindled at daybreak is a signal of her approach (see AGNI), and she then arouses the worshiper to prayer. She answers his petitions by bestowing all the blessings of daily life. In the post-Vedic period the importance of Ushas is lost, and now she is a mere name in the Hindu mythology. Consult: A. A. Macdonell, *Vedic Mythology* (Strassburg, 1897); Hillebrandt, *Vedische Mythologie*, ii (Breslau, 1899); W. J. Wilkins, *Hindu Mythology* (2d ed., London, 1900); L. D. Barnett, *Antiquities of India* (London, 1913).

USH′ER, JAMES. A British archbishop. See USSHER.

USH′ER, ROLAND GREENE (1880–). An American historian, born at Lynn, Mass. He was educated at Harvard (A.B., 1901; Ph.D., 1905), and abroad at Oxford, Paris, and Cambridge. Connected with Washington University, St. Louis, from 1907, by 1912 he had become associate professor in charge of the history department. His writings include: *The Presbyterian Movement in the Reign of Queen Elizabeth* (1905); *The Reconstruction of the English Church* (2 vols., 1910); *The Rise and Fall of the High Commission* (1913); *The Rise of the American People* (1914); *Pan-Germanism, from its Inception to the Outbreak of the War: a Critical Study* (1914); *Pan-Americanism, a Forecast of the Inevitable Clash between the United States and Europe's Victor* (1915); *The Challenge of the Future* (1916).

USHER OF THE BLACK ROD. See BLACK ROD.

USHUAIA, ōō′shōō-ī′yȧ. The capital of the Territory of Tierra del Fuego, Argentina, on the south coast of the island of Tierra del Fuego, on the Beagle Channel (Map: Argentina, F 8). It is a miserable native village, whose inhabitants, through the efforts of English missionaries, speak English better than Spanish. Pop. (est.), 500.

USKUP, ụs-kụp′, **USKUB,** or **SKOPLIE.** A city of Servia and capital of the department of the same name, 160 miles northwest of Saloniki, on the Vardar River (Map: Balkan Peninsula, C 4). The chief articles of commerce are opium, grain, live stock, fruit, and tobacco. Leather and dyestuffs are the principal manufactured products. Long the capital of the Vilayet of Kossovo in the Ottoman Empire, it was captured by the Servians in October, 1912, in the course of the Balkan War (q.v.), and was confirmed to them by the Treaty of Bucharest (August, 1913). It was captured by the Bulgarians in 1915. (See WAR IN EUROPE.) Pop., 1911, 47,384.

USNEA, ŭs′nē-ȧ (Neo-Lat., from Ar. *usnah*, moss). A small genus of lichens. The species are generally grayish or straw-colored and pendulous, and from their resemblance to southern or Spanish moss (*Tillandsia*) are often called tree mosses. They are most common upon trees in cool regions, but also grow upon rocks. They are called beard moss, hanging moss, and necklace moss. See Colored Plate of MOSSES AND LICHENS under MUSCI.

USPENSKOYE, ŭs′pĕn-skô′yĕ. See BOLGARY.

USPENSKY, ŭs-pĕn′skē, **GLEB IVANOVITCH** (1840–1902). A Russian writer of folk tales, born at Tula and educated at the universities of St. Petersburg and Moscow. His first stories appeared in the *Observer* in 1862, while he was still a student, but not before his series of sketches entitled *Stray-Street Life* began to appear in the famous *Sovremennik* (1866) did he attract general attention. Uspensky also contributed to *Notes of the Fatherland* and other periodicals. His fame was at its height when he was attacked by a disease of the brain which ended his literary career nine years before his death. Uspensky's special interest was in the sufferings of the lowly provincial folk, whose life he depicted with unusual fidelity and sympathy. His *Drudgery*, which touches upon peasant morality, practically revealed the real peasant to Russian readers, while *The Power of the Land* was a sincere plea against the urbanization of the peasantry. His collected works have been published repeatedly—one edition in six volumes (St. Petersburg, 1908).

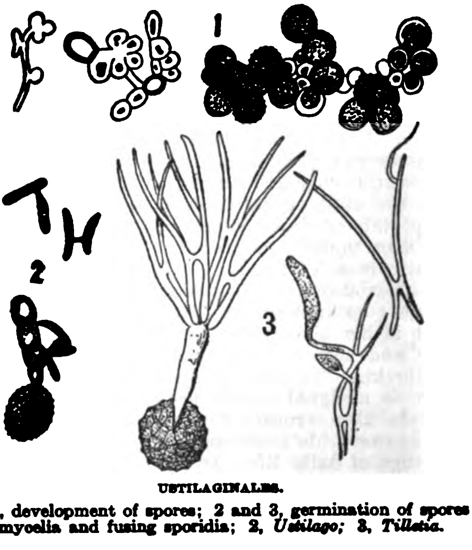
US'SHER, JAMES (1581–1656). Archbishop of Armagh, commonly considered the most learned prelate of the Irish Protestant church. He was born in Dublin, Jan. 4, 1581. In 1594 he entered Trinity College, Dublin, where his predilection for history soon revealed itself. In 1601 he was ordained deacon and priest, and was appointed preacher of Christ Church, Dublin. In 1607 he was chosen to the chair of divinity, a post which he held for 13 years. He made numerous visits to England and became acquainted with the most distinguished scholars of the age. In 1613 his first publication appeared, entitled *De Ecclesiarum Christianarum Successione et Statu*, which was designed as a continuation of Bishop Jewell's *Apology*. In 1615 he was appointed by a convocation of the clergy held at Dublin to draw up a series of articles relating to the doctrine and discipline of the Irish Protestant church, in which the doctrines of predestination and reprobation (of which Ussher was an unflinching apologist) found prominence. These and other views, such as that bishops were not a different order from presbyters, implied in the studied omission of all reference to such distinction, that the Sabbath should be strictly enforced, and that no toleration should be granted to Catholics, laid him open to the charge of Puritanism. Nevertheless, King James promoted him to the bishopric of Meath and Clonmacnoise in 1621 and in 1623 constituted him a Privy Councilor of Ireland. In 1624–25 he was raised to the highest ecclesiastical dignity in Ireland, the archbishopric of Armagh. In 1632 Ussher published *Veterum Epistolarum Hibernicarum Sylloge*, a collection of letters out of several ancient MSS., concerning the state of the Irish church from 592 to 1180; in 1638, *Immanuel, or the Mystery of the Incarnation;* in 1639, *Britannicarum Ecclesiarum Antiquitates*, an account of the British church to the end of the seventh century; in 1641, *The Judgment of Doctor Rainololdes touching the Originall of Episcopacy Confirmed;* and *The Originall of Bishops*. When the Civil War broke out, Ussher, who was in England at the time, espoused the side of the King, refused an appointment to Westminster Assembly, and made himself obnoxious to the Parliament by the sermons which he preached at Oxford. Upon the triumph of the parliamentary party his property and revenues in Ireland were seized, and after a residence in Wales and elsewhere, he came to London, where in 1647, in spite of his Royalist sympathies, he was chosen preacher of Lincoln's Inn, a post which he retained till his death at Reigate, March 21, 1656. Cromwell ordered his remains to be interred with great magnificence in Erasmus' Chapel in Westminster Abbey.

Ussher's chief works, besides those already mentioned, are his edition (1644) of the *Epistolæ* of Polycarp and Ignatius; his treatise *De Romanæ Ecclesiæ Symbolo Apostolico Diatribe* (1647); *Dissertatio de Macedonum et Asianorum Anno Solari* (1648); and *Annals of the Old Testament* (1650–54), a chronological work. After his death there were published (from his numerous MSS.) *Chronologia Sacra, etc.* (Oxford, 1660), by which and his *Annals* he is most widely known. These chronological calculations long appeared in the inner margin of the Bible in the Authorized Version. The most frequently reprinted work attributed to him is the posthumous *Strange and Remarkable Prophecies and Predictions of James Ussher* (London, 1678; new ed., 1825). A collected edition of Ussher's works, in 71 vols., with a new biography, was published at Dublin in 1841–64 by C. R. Erlington and J. H. Todd. Consult also the *Life* by Carr (London, 1895), and W. B. Wright, *The Ussher Memoirs* (Dublin, 1889).

USSURI, o͞o-so͞o'rê. A right-bank tributary of the lower Amur. Its head streams rise to the northeast of Vladivostok. After a course of 90 miles it receives the Sungachi, which drains Lake Khangka. The Ussuri forms the boundary in part between Manchuria and the Russian Maritime Province. The general course of the Ussuri is northeasterly, and it joins the Amur a little west of Khabarovsk, from which point the Amur valley is connected with Vladivostok by a railroad along the Ussuri valley.

UST-BYELOKALITVENSKAYA, o͞ost byĕ'lô-kä'lêt-vĕn'skȧ-yȧ. A Cossack settlement in the Province of the Don Cossacks, southeastern Russia, on the Donetz, about 70 miles northeast of Tcherkask. Pop., 1897, 18,039.

USTILAGINALES, ŭs'tĭ-lăj'ĭ-nā'lēz (Neo-Lat. nom. pl., from Lat. *ustilago*, plant of the thistle kind). A group of parasitic fungi commonly called smuts or brand fungi, and found on flowering plants, whose floral parts and ovaries especially are subject to the attack. Some smuts are very destructive, as corn smut (*Ustilago maydis*) and the stinking smut of wheat (*Tilletia tritica*). The vegetative mycelium of the smut is inconspicuous until the season is well advanced and the ovary should begin to ripen. Then the ovary and the adjoining floral parts become filled with the fungal filaments. At the end of the season this mycelium produces immense numbers of resting spores (chlamydospores) known as brand spores. These escape as a black powder, and survive the winter, germinating with the return of spring. The spore develops a short filament (promycelium), which exhibits far greater variation of structure than in the rusts. Numbers of minute spores (sporidia) are developed by the promycelium, and, falling upon the seedlings



USTILAGINALES.

1, development of spores; 2 and 3, germination of spores promycelia and fusing sporidia; 2, *Ustilago;* 3, *Tilletia.*

and young plants of the proper host, or in the opening flowers in some genera, germinate, sending the germ tubes through the stomata into the tissues.

For a general account of the Ustilaginales consult Engler and Prantl, *Die natürlichen Pflanzenfamilien* (Leipzig, 1887), and Plowright, *British Uredineæ and Ustilagineæ* (London, 1889). See BASIDIOMYCETES; SMUT.

UST-MEDVEDITSA, o͞ost-mĕd-vyĕd′ĭt-sȧ. A Cossack settlement in the Province of the Don Cossacks, southeast Russia, on the right bank of the Don, near its confluence with the Medveditsa (Map: Russia, F 5). Pop., 1910, 10,400.

USTYUG VELIKY, ṳs-tyṳk′ vyĕ-lyĕ′kē. A town in the Government of Vologda, Russia, situated at the junction of the Sukhona with the Yug, 303 miles northeast of Vologda (Map: Russia, G 2). It has linen factories of considerable importance. Pop., 1911, 18,707.

USUFRUCT, ū′zū̇-frŭkt (Lat. *ususfructus*, from *usus*, use, from *uti*, OLat. *olti*, to use, connected with *avere*, to crave, Skt. *av*, to promote, protect, like, Gk. *οἶτος*, *oitos*, fate, portion + *fructus*, fruit, from *frui*, to enjoy). At civil law, a life interest in property, usually established by legacy, but capable of being established by contract. It is also created by law, especially in modern civil legislations, many of which give usufruct to parents in the property of minor children and to the surviving spouse in the estate of the deceased husband or wife. (See PARENT AND CHILD; SUCCESSION; TESTAMENT.) Usufruct is regarded as a servitude (q.v.), the general right of ownership (*proprietas*) being attributed to the reversioner, i.e., the person who is to take the property on the termination of the usufruct. The usufructuary has the exclusive right to possess, use, and enjoy the property, either in person or through a vendee or lessee. He must, however, use it *salvâ substantiâ*, i.e., the property must not be injured; nor may he change the character or mode of use. For the restoration of the property in unimpaired condition the usufructuary must ordinarily give security to the owner. Usufruct may be established not only in land and buildings, but also in nonconsumptible movables, i.e., in such movables as can be used without impairment of substance. In consumptibles, true usufruct is impossible; but for the purpose of carrying out the intentions of testators the Roman jurists developed the so-called quasi-usufruct, in which the property is appraised and the usufructuary gives security that the sum at which it is valued shall be paid, after his death, to the holder of the reversionary interest. In modern law a usufruct or life interest may generally be freely created both as to real and personal property.

USUMACINTA, o͞o′sṳ-mȧ-sēn′tȧ. A river of Central America. It rises in the mountains of southern Guatemala and flows in a winding northwest course through that country and Mexico, emptying into the Gulf of Campeche on the boundary between the Mexican states of Campeche and Tabasco (Map: Central America, B 2). Its length is about 400 miles, and it is navigable a short distance from the sea. In its middle course it forms the boundary between Mexico and Guatemala. Its upper course, which is through a little-known forest region, was made by treaty the boundary between the two republics, and a dispute as to which was the main head stream nearly led to a war in 1895.

USURY (OF., Fr. *usure*, from Lat. *usura*, use, employment, interest, from *uti*, to use). Literally, money paid for the use of money, i.e., interest; but in the Middle Ages, when such payments were prohibited, the word obtained an evil sense, and when in modern times the taking of interest again became permissible, usury acquired its modern meaning, i.e., interest in excess of a fair return, and, particularly, in excess of a legally determined maximum. The establishment of such a maximum was general in the ancient world; at Roman law it varied, at different periods, from 12 per cent to 6 per cent; and when the taking of interest was legalized in the modern world, similar limitations were introduced. In England the Act of 37 Henry VIII, c. 9, fixed the limit at 10 per cent. This was repeatedly lowered until, by the Act of 12 Anne, c. 16, it was fixed at 5 per cent. By these laws usurious contracts were made wholly invalid and usury was an indictable offense. In most European countries (as in the Roman law) usurious contracts were invalid only as regarded the excess of interest, and contracts in which the lender assumed special risks (e.g., bottomry bonds) were not subjected to limitation of rate.

In the eighteenth century the usury laws were attacked by economic writers as arbitrary and unwise. It was pointed out that in all credit transactions there was an element of risk; that the risk varied greatly and might, in many cases, justify the taking of interest beyond the legal maximum; and that the effect of usury laws was to impose upon borrowers a higher rate of interest than they would otherwise be required to pay, in order that the lender might insure himself against the additional risk to which he was subjected by the illegality of the contract. In consequence of these arguments limitations upon the rate of interest were generally repealed in the nineteenth century. In England this was done by the Act of 17 and 18 Vict., c. 90. In France, however, the usury laws were repealed only as regarded commercial contracts.

Adam Smith defended usury laws because they made it more difficult for spendthrifts to borrow money; and in the latter half of the nineteenth century, in connection with the general reaction against laissez-faire doctrines, the complete freedom of contract established by the repeal of the usury laws was in its turn condemned by many economists. It was urged that in many cases borrowers were at the mercy of lenders and that they should be protected against extortion of unreasonable interest. This theoretical reaction has affected modern European legislation. In Germany, by a law of 1880, "any person who, by exploiting the necessity, the frivolity, or the inexperience of another, causes to be promised to himself or to a third person, for a loan or for deferred payment of a debt, pecuniary advantages which so exceed the ordinary rate of interest that under the circumstances they are in striking disproportion to the debt," is punished with imprisonment up to six months and fine up to 3000 marks. By law the legal commercial rate is limited to 5 per cent in Germany and 6 per cent in France. In England, by an act of Parliament passed in 1900, it is provided that professional money lenders shall be registered, and that their contracts shall be subject to judicial revision when the rate of interest appears under the circumstances to be unreasonable. This leaves it to the courts to determine what is, in each case, a reasonable rate. In the United States laws are enacted fixing the legal rate and the contract rate of interest. All States fix legal rates, or maximum rates collectable in the absence of definite agreement, at from 5 to 8 per cent. All but Vermont have fixed maximum contract rates, usually at 10 or 12 per cent, but at any rate whatever in California, Colorado, Maine, Massachusetts, and Rhode Island. In recent years various States have enacted special laws regulating pawnbrokers and the business of lending money on salaries ("loan sharks"). The penalties for violations of usury laws are varied. In Connecticut, Georgia, Indiana, Kansas, Kentucky, Maryland, Missouri, New Mexico, Ohio, Pennsylvania, Tennessee, Vermont, and West Virginia the creditor can recover principal and lawful interest, losing only the excess interest. The penalty is loss of interest in Alabama, Alaska, Arizona, District of Columbia, Florida, Idaho, Illinois, Iowa, Louisiana, Michigan, Minnesota, Mississippi, Nebraska, New Jersey, Oklahoma, Porto Rico, South Carolina, South Dakota, Texas, Virginia, Wisconsin, Hawaii, and Wyoming. In some States a usurious contract is wholly void; thus in Arkansas, New York, and Rhode Island both principal and interest are lost, and in Delaware and Oregon the principal; moreover Rhode Island adds fine or imprisonment. In Idaho the lost interest and in Oregon the lost principal are paid by the borrower to the school fund. In some of these States money actually paid on a usurious contract cannot be recovered by the lender; but the general rule is to the contrary, and in some States the actual receipt of usurious interest exposes the lender to further penalties, e.g., double the amount paid in North Carolina, North Dakota, and Washington, and three times the excess in New Hampshire. California, Colorado, Maine, Montana, and Nevada have enacted no specific penalties for usury. In some other States the lender is liable to prosecution and fine or imprisonment, but such prosecutions are rare. In Delaware any person may bring action against a lender who has received usurious interest, and, if successful, will receive one-half of the principal of the debt, the other half going to the State.

Not infrequently special contracts are exempted from the operation of the usury laws, either because special risks are assumed by the lender, or on grounds of commercial interest. In several States corporations are not permitted to plead usury.

Usury laws are, in general, strictly construed. Whenever the law declares a usurious contract invalid, mortgages, trust deeds, and all forms of surety are also invalidated; but the courts do not assume that a Legislature has intended to avoid the contract as regards the principal of the debt, or as regards the legal interest, unless such penalty is expressly imposed; nor is penalty, as distinguished from the protection of the borrower, incurred by merely stipulating for usurious interest, but only by receiving it.

In interstate cases (conflicts of law, q.v.) the question whether a contract is or is not usurious is governed by the law of the place where the contract was concluded, unless a different place was expressly or impliedly indicated as the place of performance. When a debt has been contracted in one State to be paid in another, and the rate of interest stipulated is usurious in one of the States but not in the other, some of the courts apply the local law which will uphold the contract. Penalties in the strict sense (as distinguished from the legal protection given to the borrower) are not enforced outside of the jurisdiction in which they are imposed. See INTEREST.

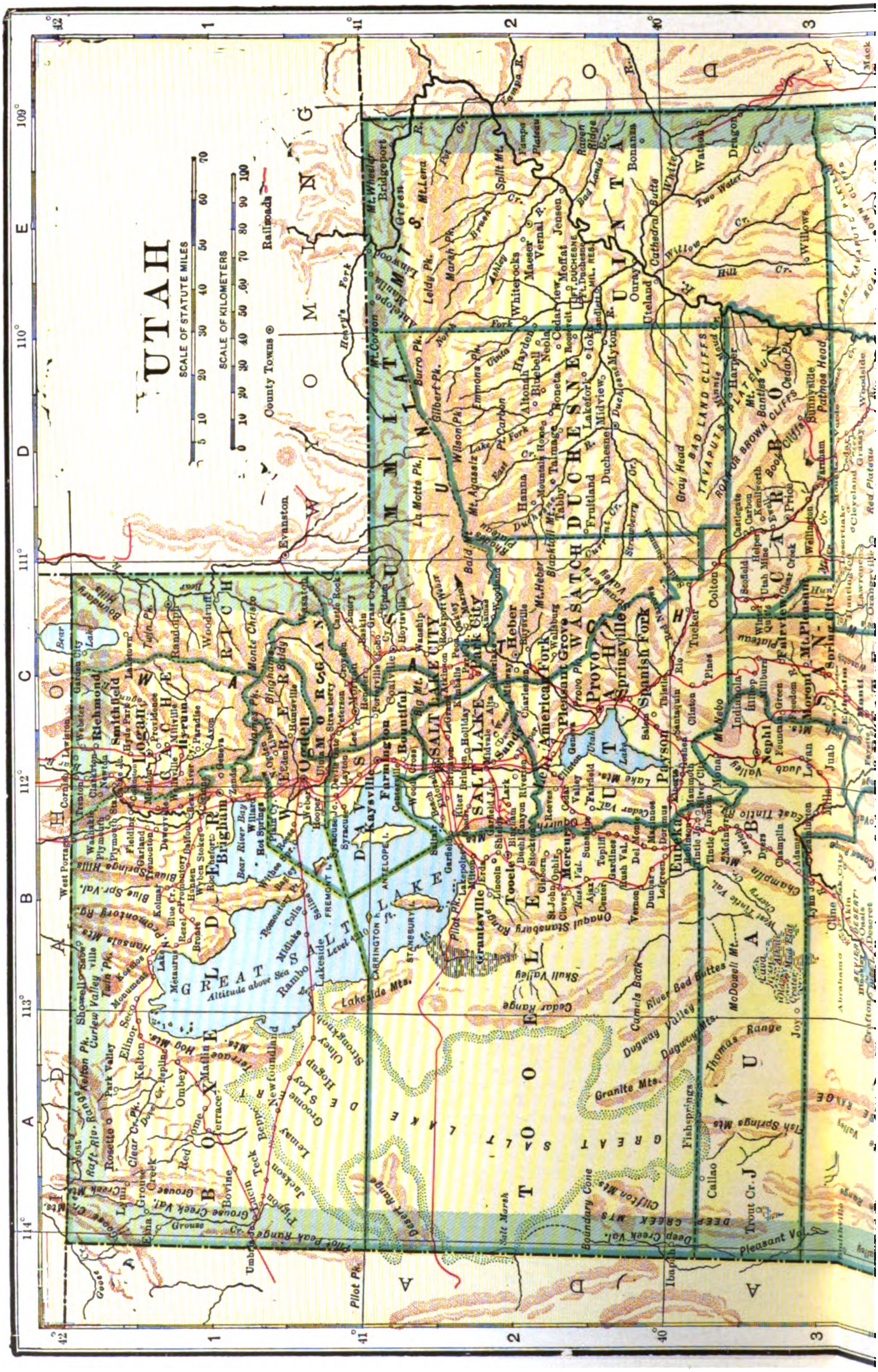
Consult: Turgot, *Mémoire sur les prêts d'argent* (1741); Bentham, *Defense of Usury* (London, 1787); Murray, *History of Usury* (Philadelphia, 1866); Von Stein, *Der Wucher und sein Recht* (1880); Caro, *Der Wucher: eine socialpolitische Studie* (1893); J. A. Webb, *A Treatise on the Law of Usury* (St. Louis, 1899); Wm. Cunningham, *Christian Opinion on Usury* (London, 1884); F. J. Stimson, *American Statute Law* (Boston, 1902).

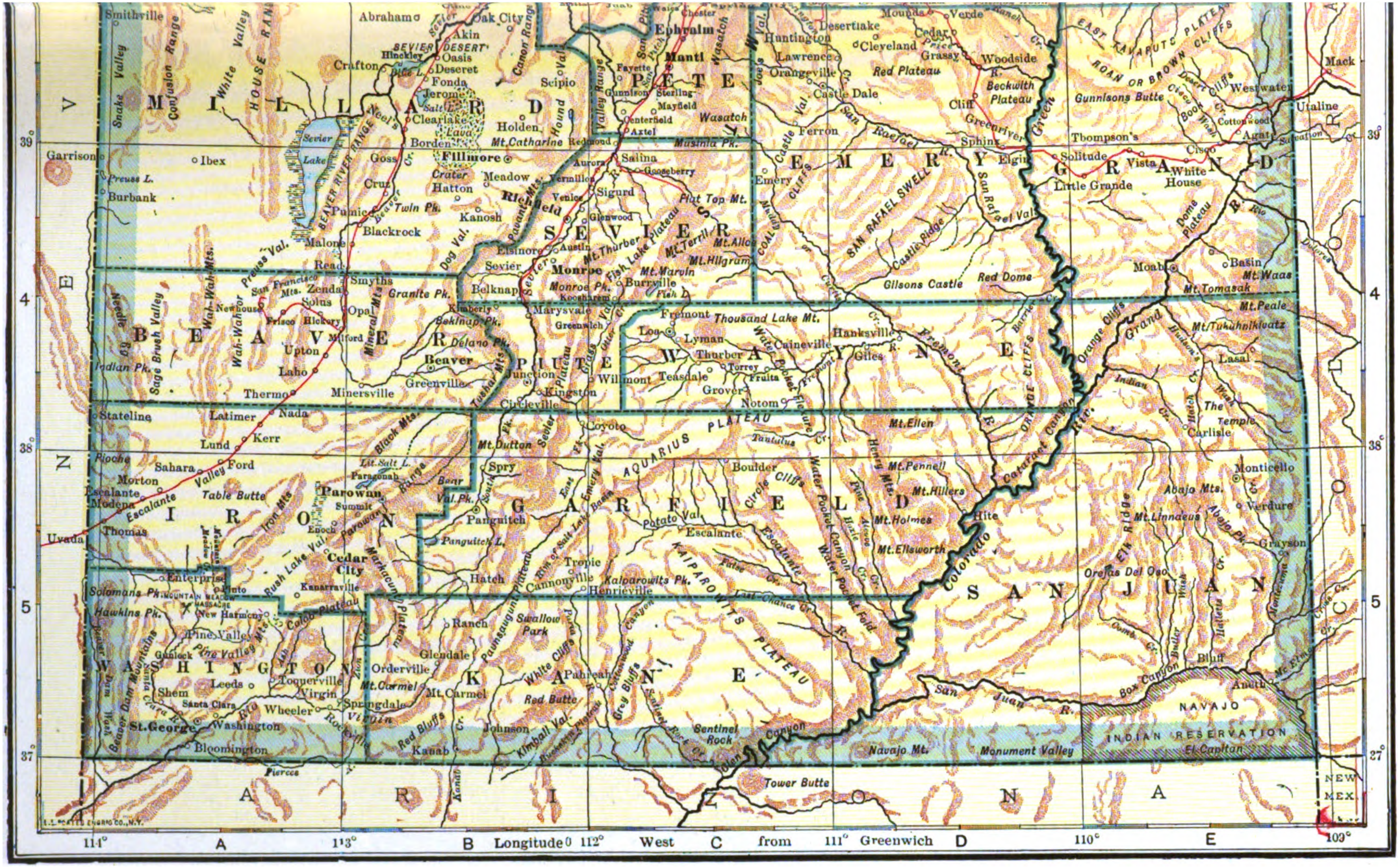
UTA, ū'tȧ (Neo-Lat., from the State of *Utah*). A genus of iguanid lizards, several species of which are numerous on the southwestern plains of the United States, one of which (*Uta stansburiana*) is one of the most beautiful and graceful of American lizards. It is blackish brown above, marbled with lighter dots, and banded with yellow below. Its long, slender tail has a crest of large vertically set scales. This genus combines structural characteristics of *Sceloporus* and *Holbrookia*.

UTAH, ū'tä (named from the Ute or Utah tribe of Indians). A State in the western part of the United States called by the Mormon pioneer settlers *Deseret*, a term taken from the Book of Mormon and signifying industry. Its boundaries are limited by lat. 37° and 42° north, and long. 109° 4′ and 114° 4′ west. Its shape is practically that of a rectangle 345 miles long north-south by 270 miles wide east-west, indented at the northeast corner by Wyoming. The State has an area of about 85,000 square miles, including a probable average of 3000 square miles of lake water. The latter area, on account of the shallowness of the water and the variation of annual rainfall, changes considerably from year to year. Utah ranks eighth in size among the States of the Union.

Topography. Utah is divided into two great provinces, an eastern and a western, by the Wasatch Mountains, which enter the State from Idaho and extend in a southerly direction for about 150 miles, terminating at Mount Nebo, which is situated almost precisely at the centre of the State. This central highland continues southward as the High Plateau to central Arizona. The eastern half contains all of the high and more serrate mountains, while the western forms a part of the Great Basin, much of which is relatively flat, with small ranges here and there half buried in the sediments of the Pleistocene Lake Bonneville. The Wasatch Mountains constitute a lofty and picturesque range, especially when viewed from the west. A noteworthy feature is that while most of the water of this range drains westward into the Great Basin, it has to cut through the principal mountain axis to do so. Evidences of recent glacial action, such as lakes, cirques, moraines, etc., are abundant in many of the cañons. At several points these mountains reach an elevation of practically 12,000 feet.

The Uinta Mountains trend east-west within the extreme northeastern part, and in the matter of direction of axis, form perhaps the most notable exception of all the ranges comprising the Rocky Mountain system. They are the loftiest in the State, having four peaks over 13,000


UTAH
SCALE OF STATUTE MILES
0 5 10 20 30 40 50 60 70
SCALE OF KILOMETERS
0 10 20 30 40 50 60 70 80 90 100
County Towns ⊙
Railroads


MILLARD
BEAVER
IRON
WASHINGTON
SANPETE
SEVIER
PIUTE
WAYNE
GARFIELD
KANE
EMERY
GRAND
SAN JUAN
NEVADA
ARIZONA
COLORADO
NEW MEX.
Smithville
Snake Valley
Confusion Range
White Valley
HOUSE RANGE
Abraham
Oak City
Akin
SEVIER DESERT
Hinckley
Oasis
Deseret
Crafton
Fonda
Jerome
Salt L.
Clearlake
Lava
Borden
Fillmore
Canon Range
Scipio
Holden
Hound Val.
Mt. Catharine
Redmond
Valley Range
Ephraim
Manti
Fayette
Gunnison
Sterling
Mayfield
Centerfield
Axtel
Wasatch
Musinia Pk.
Garrison
Ibex
Preuss L.
Burbank
Sevier Lake
BEAVER RIVER RANGE
Goss
Crater
Meadow
Hatton
Cruz
Pumice
Twin Pk.
Kanosh
Blackrock
Malone
Richfield
Aurora
Vermillion
Venice
Sigurd
Salina
Gooseberry
Glenwood
Flat Top Mt.
Elsinore
Austin
Sevier
Monroe
Monroe Pk.
Mt. Thurber
Fish Lake Plateau
Mt. Terrill
Mt. Alice
Mt. Hilgram
Mt. Marvin
Burrville
Koosharem
Fish L.
Belknap
Dog Val.
Preuss Val.
Wah-Wah Mts.
Needle Rg.
Indian Pk.
Sage Brush Valley
Wah-Wah or
Newhouse
San Francisco Mts.
Frisco
Zenda
Solus
Hickory
Read
Smyths
Opal
Granite Pk.
Milford
Mineral Mts.
Upton
Laho
Thermo
Minersville
Kimberly
Belknap Pk.
Delano Pk.
Beaver
Greenville
Tushar Mts.
Junction
Marysvale
Greenwich
Kingston
Circleville
Stateline
Latimer
Nada
Kerr
Lund
Pioche
Sahara
Valley Ford
Morton
Escalante
Modena
Escalante Valley
Table Butte
Thomas
Uvada
Iron Mts.
Black Mts.
Lit. Salt L.
Paragonah
Parowan
Summit
Enoch
Cedar City
Bear Val. Pk.
Kanarraville
Rush Lake Val.
Enterprise
Pinto
Solomans Pk.
MOUNTAIN MEADOW MASSACRE
Hawkins Pk.
New Harmony
Pine Valley
Pine Valley Mts.
Gunlock
Leeds
Shem
Santa Clara
Toquerville
Virgin
Wheeler
St. George
Washington
Bloomington
Beaver Dam Mountains
Beaver Dam Wash
Springdale
Rockville
Colob Plateau
Markagunt Plateau
Pierces
Fremont
Thousand Lake Mt.
Loa
Lyman
Thurber
Caineville
Teasdale
Torrey
Fruita
Grover
Notom
Wilmont
Water Pocket Flexure
Hanksville
Giles
Fremont R.
Mt. Ellen
Henry Mts.
Mt. Pennell
Mt. Hillers
Mt. Holmes
Mt. Ellsworth
AQUARIUS PLATEAU
Coyoto
Tantalus Cr.
Boulder
Circle Cliffs
Water Pocket Canyon
Water Pocket Fold
Potato Val.
Escalante
Escalante R.
Mt. Dutton
Sevier R.
Spry
Panguitch
Panguitch L.
Emery Val.
Tropic
Cannonville
Henrieville
Hatch
Kaiparowits Pk.
KAIPAROWITS PLATEAU
Last Chance Cr.
Ranch
Swallow Park
Paunsagunt Plateau
Glendale
Orderville
Mt. Carmel
White Cliffs
Pahreah
Red Butte
Grey Bluffs
Red Bluffs
Kanab
Johnson
Kimball Val.
Sentinel Rock
Glen Canyon
Tower Butte
Navajo Mt.
Huntington
Desertlake
Cleveland
Lawrence
Orangeville
Castle Dale
Ferron
Castle Val.
Emery
Red Plateau
Grassy
Cedar
Price R.
Mounds
Verde
Woodside
Beckwith Plateau
Cliff
Greenriver
Sphinx
Elgin
San Rafael R.
SAN RAFAEL SWELL
Castle Ridge
Gilsons Castle
Red Dome
San Rafael Val.
COAL CLIFFS
EAST KAIPAROWITS PLATEAU
ROAN OR BROWN CLIFFS
Gunnisons Butte
Thompson's
Solitude
Vista
White House
Little Grande
Cisco
Westwater
Cottonwood
Agate
Utaline
Mack
Dome Plateau
Moab
Basin
Mt. Waas
Mt. Tomasak
Mt. Peale
Mt. Tukuhnikivatz
Lasal
Dolores R.
Grand R.
Green R.
Orange Cliffs
ORANGE CLIFFS
Cataract Canyon
Colorado R.
Hite
Indian Cr.
The Temple
Carlisle
Monticello
Abajo Mts.
Abajo Pk.
Verdure
Mt. Linnaeus
Elk Ridge
Orejas Del Oso
Grayson
Bluff
Comb Wash
Butler Wash
Montezuma Cr.
Aneth
Box Canyon
San Juan R.
NAVAJO INDIAN RESERVATION
El Capitan
Monument Valley
39°
38°
37°
114°
113°
112°
111°
110°
109°
A
B
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E
Longitude 112° West from Greenwich
L.L. POATES ENGR'G CO., N.Y.

feet, the highest of which is Gilbert Peak, with an elevation of 13,687. These mountains are unusually steep and serrate, and in the highest parts are thickly set with numerous glacial lakes. Away to the south and southeast are the Henry, Abajo, and La Sal mountains. The world's largest and most famous natural bridges are situated in the Bad Lands country across the Colorado River from the Henry Mountains. See NATURAL BRIDGE.

The mountains of west Utah are much lower than those in the east. The relationship of these mountains to the recent alkaline sediments surrounding them in many places gives them the appearance of islands protruding from water.

Hydrography. Eastern Utah is drained by a large number of streams, all of which finally unite to form the great Colorado. Except in their upper courses most of the streams flow through deep, steep-sided cañons, eroded far below the plateau floor. A very small area in the extreme northwestern part of the State sends its waters through the Snake River drainage to the Pacific Ocean. The remaining part of western Utah lies within the Great Basin, and contributes its waters chiefly to two closed drainage systems, the Sevier and Great Salt Lake. All of the streams of this section have their origin in the central highland and flow generally westward into the depressions just mentioned. Sevier Lake, which, during dry seasons, is scarcely more than a salt playa, derives its waters chiefly through Sevier River, which has its head far up in the High Plateau region. Great Salt Lake is supplied principally by Weber River, Bear River, Malad River, and Jordan River, the latter being overflow from Utah Lake to the southward, which in turn is supplied by a number of cañon streams. In the southern part of the Great Basin numerous streams flow from the mountains only to be lost in the sands of near-by desert sections. Great Salt Lake (q.v.) is the most conspicuous natural feature of the State.

Soil. The soil in many local sections is unusually fertile, especially in the upland valleys and other areas adjacent to the mountains, but over a large part of the Great Basin floor it is highly alkaline and incapable in its present condition of supporting vegetation. The better grades of soil are deep sandy loams derived from the silt of cañon streams. Until within recent years practically all of the crops were produced by artificial watering, but of late rapid improvement in dry-farming methods has brought about the utilization of considerable acreage where irrigation is impossible.

Climate. The climate in the main is of the plateau type, characterized by rather wide extremes in summer and winter. The populated areas, however, are generally mild and equable, largely because of the protection which comes from the near-by mountains. The precipitation varies from 6 to 25 inches between points ranging from 2800 to 7000 feet elevation, a variation which is largely due to topographic conditions. The average precipitation is 12.5 inches. The average temperatures are 71° in July and 26° in January, or an annual average of 48°.

Geology. The surface geology of Utah is extremely complicated, especially in the mountainous districts. Every formation from ancient to recent is represented, as are also a wide variety of structural forms. The Wasatch Mountains may be regarded as a great fold broken down on the west side by an enormous fault extending almost the entire length of the range. The axis of this half fold is also flexed at right angles to its elongation, thus giving rise to considerable complexity. Formations from Pre-Cambrian to Cretaceous are involved in the mountains proper, with Tertiary sediments and more recent igneous extrusions flanking them on the east and Pleistocene lake deposits on the west. The High Plateau is composed of Mesozoic to Genozoic sediments capped in a large number of places by recent surface flows. The Uinta Mountains consist of a great anticlinal fold with marked displacement on the north flank. Along the axis vast erosion has carried away all of the formation from Cretaceous down to Pre-Cambrian. The Tertiary sediments here also overlap the eroded and upturned edges of the older members. The Henry Mountains, situated far down in the plateau province, furnish several examples of the world's best type of laccolith, and consist of intrusive cores flanked by upturned sediments. The block type of mountain is well represented by the ranges of western Utah, where the formations are practically all of Paleozoic and Pre-Cambrian age.

Mineral Resources. Utah possesses vast quantities of high grade bituminous coal, also large deposits of lignite, both of Cretaceous age. The State is famous for its production of elaterite, ozokerite, and other natural hydrocarbons. Radium-bearing ores have recently been added to its production. Enormous iron deposits in the southwestern part of the State are awaiting development. Utah, ranking thirteenth in 1914 in the total value of mineral production, is unique in that, while it does not lead in the value of any one product, it is among the foremost States in the production of the various precious and semiprecious metals. Copper is the most important product of its mines, about four-fifths of it coming from Salt Lake County; the production in 1914 amounted to 152,034,002 pounds, valued at $20,220,522. Lead ranks second, and of this metal 86,662 tons valued at $6,681,602 were produced in 1914. Utah ranked third in the value of lead production, about 90 per cent of which is from silver-lead ores, which also supply about half of the silver product. The value of the silver produced in 1914 was $6,168,660 for 11,154,916 fine ounces. Coal is the most important of the non-metalliferous minerals. The production, almost entirely from Carbon County, amounted to 3,103,036 tons valued at $4,935,454. Most of the gold produced is obtained from the refining of copper, though about 35 per cent of it is obtained from dry or siliceous ores. The production in 1914 amounted to 157,961 fine ounces valued at $3,265,347. Of zinc there were produced in that year, 7995 tons valued at $815,453. Other minerals produced are asphalt, cement, clay products, gems, gypsum, lime, salt, sand and gravels, stone. The total value of the mineral production in 1914 was $45,624,698.

Agriculture. With a rainfall ranging from 5 to 10 inches over the greater part of Utah, reaching 15 inches only in the north central section, farming can only be carried on successfully by the aid of irrigation. Of the total land area of 52,597,760 acres, in 1910, 3,397,699 acres were in farms which numbered 21,676. The improved land in farms measured 1,368,211 acres, and the average size per farm was 156.7 acres. The total value of all farm property including land, buildings, implements, and machinery, domestic animals, poultry, and bees was $150,795,201. Of the total number of farms in 1910, 19,956 were operated by owners and managers. The foreign-born white farmers numbered 5452, of whom 1922 were English and 1420 Danish. There were but 276 nonwhite farmers.

The following table shows the acreage, production, and value of some of the principal crops as estimated by the Department of Agriculture for 1915.

CROPS	Acreage	Prod. in bu.	Value
Corn	13,000	442,000	$354,000
Wheat	320,000	8,225,000	7,074,000
Oats	100,000	4,700,000	2,115,000
Rye	13,000	202,000	131,000
Potatoes	20,000	2,500,000	1,575,000
Hay	394,000	985,000	7,880,000
Barley	34,000	1,445,000	751,000

In 1909 the total value of all crops was $18,484,615. The leading crops in order of importance in that year are, hay and forage, wheat, sugar beets, oats, potatoes, and barley. The acreage, production, and value of these products in 1909 were as follows: Hay and forage, 405,394 acres produced 1,015,913 tons valued at $7,429,901; wheat, 178,423 acres produced 3,943,910 bushels valued at $3,765,017; sugar beets, 27,472 acres produced 413,946 tons valued at $1,858,600; oats, 80,816 acres produced 3,221,289 bushels valued at $1,671,065; potatoes, 14,210 acres produced 2,409,093 bushels valued at $873,961; barley, 26,752 acres produced 891,471 bushels valued at $472,816. Vegetables, other than potatoes, had a combined acreage of 7006, and a production valued at $717,776. Orchard fruits, of which the most important are apples, peaches, and cherries, had products valued at $640,904. Strawberries are the most important of the small fruits, of which there were produced 3,118,395 quarts valued at $217,327 in 1909.

Live Stock and Dairy Products. In 1909 the total value of domestic animals on farms was $28,330,215. On Jan. 1, 1916, the United States Department of Agriculture estimated that horses numbered 146,000 valued at $12,556,000; mules numbered 2000 valued at $156,000; milch cows numbered 96,000 valued at $5,952,000, other cattle numbered 408,000 valued at $14,606,000; sheep numbered 2,089,000 valued at $11,281,000; swine numbered 112,000 valued at $874,000. The number of fowls reported on farms in 1910 was 691,941 valued at $327,908. The amount of milk produced in 1909 was 20,486,317 gallons, and the total value of milk, cream, and butter fat sold and butter and cheese made was $2,067,534. The eggs produced amounted to 4,240,007 dozens valued at $907,330. The wool sheared in 1915 was estimated to amount to 13,320,000 pounds.

Irrigation. Irrigation is practiced throughout the State, 19,709 farms being so treated in 1909. The acreage irrigated was 999,410, of which 22,448 acres were irrigated by individual and partnership enterprises and 687,260 acres by coöperative enterprises. In all there were in 1910, 2472 enterprises operating 7709 miles of ditches of which 5887 were main ditch having a total capacity of 25,081 cubic feet per second. The Strawberry valley project was the only one being built by the United States Reclamation Service in 1915. This, when completed, will irrigate about 60,000 acres. The reservoir is designed to contain some 280,000 acre-feet of water and to cover an area of 8200 acres when full.

Manufactures. Utah ranked fortieth among the States in value of manufactured products in 1909. The value of products per capita in that year was $166. The following table gives the more important details regarding the five leading industries, as judged by value of products, for 1904, 1909, and 1914.

SUMMARY OF MANUFACTURES FOR 1914, 1909, AND 1904

THE STATE — FIVE LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED IN INDUSTRY		Capital	Wages	Value of products	Value added by manufacture
			Total	Wage earners (average number)	Expressed in thousands			
All industries	1914	1110	17,129	13,894	$71,653	$10,852	$87,114	$24,880
	1909	749	14,133	11,785	52,627	8,400	61,989	20,723
	1904	606	9,650	8,052	26,004	5,157	38,926	13,986
Butter, cheese, and condensed milk	1909	37	285	214	1,134	116	1,971	358
	1904	49	159	98	406	55	964	175
Cars and general shop construction and repairs by steam-railroad companies.	1909	8	1,790	1,731	959	1,402	2,740	1,515
	1904	7	1,337	1,248	522	964	1,887	1,060
Confectionery	1909	17	745	586	1,009	204	1,952	661
	1904	12	405	335	401	103	1,005	317
Flour-mill and gristmill products	1909	60	282	184	2,042	131	3,131	620
	1904	63	278	150	1,212	91	2,426	383
Printing and publishing	1909	122	1,475	967	2,022	685	2,405	1,682
	1904	104	873	545	1,081	369	1,523	1,198

Of the total number of wage earners in 1909, 10,562 were male and only 110 under 16 years of age. The prevailing hours of labor for more than half the wage earners were from 54 to 60 per week. The extent to which the manufactures of Utah are centred about the two cities, Salt Lake and Ogden, is shown by the fact that 41.8 per cent of the total number of establishments, 47.6 per cent of the wage earners, and 27.5 per cent of the value of products were attributed to them. For further details regarding the manufacturing of these cities see under the individual titles.

Transportation. There are no navigable rivers. Railways centre mostly about Salt Lake City. The total mileage of main track in 1915 was 2354. The most important lines and their mileage in that year are the Denver and Rio Grande, 762; the San Pedro, Los Angeles, and Salt Lake, 498; the Central Pacific, 273; the Oregon Short Line, 242; the Western Pacific, 121, and the Union Pacific, 75.

Banks. The history of banking in Utah is very uneventful. Private bankers became active towards 1860, and from 1860 to 1870 some banks were organized under the Territorial law. The first national bank was established in 1872 with Brigham Young as its president. Like all the economic activities of the Mormons, the banks were controlled by the church authorities, and the high development of mutual confidence which characterizes the members of this faith has saved the banks from crises. Even during the hard times of 1893 the banks of Utah all remained solvent. State banks are more numerous and do a much larger business than the national banks. Savings banks have existed since 1873.

The condition of the banks in 1915 is shown in the following table:

ITEMS	National banks	State banks
Number	23	75
Capital	$3,355,000	4,265,880
Surplus	1,593,000	1,083,101
Cash, etc.	1,651,000	1,661,447
Deposits	21,072,000	22,715,760
Loans	18,466,000	20,973,696

Government. The constitution adopted on Nov. 5, 1895, has been amended in important essentials. Amendments which may be proposed by either House become part of the constitution when approved by a two-thirds vote of the Legislature and accepted by the electors. Two-thirds of the members of each branch of the Legislature may recommend the calling of conventions to revise the constitution.

Legislative.—The legislative power is vested in the Senate and the House of Representatives. The initiative and referendum are provided for in the Constitution, though until 1916 they had never been in force. Senators are chosen for a term of four years, and members of the House of Representatives for two years, and both must be at least 25 years of age. Regular sessions of the Legislature are held biennially in odd years.

Executive.—The executive department consists of the Governor, Secretary of State, State Auditor, State Treasurer, Attorney-General, and Superintendent of Public Instruction. All hold office for four years. The Governor and Secretary of State must be at least 30 years of age, and the Attorney-General 25 years. All must have been residents of the State for five years next preceding their election. The State Auditor and State Treasurer are ineligible for election as their own successors.

Judicial.—The judicial power is vested in a supreme court, district courts, justices of the peace, and such other inferior courts as are established by law. The supreme court consists of three judges, who are elected for six years, and must be at least 30 years of age. The State is divided into seven judicial districts, for which one or more judges are chosen by the electors for a term of four years. The Legislature may change the limits of any judicial district, or increase the number of districts or the judges thereof. The district court has appellate jurisdiction also from all inferior courts.

Suffrage and Elections.—Every citizen of the United States of the age of 21 years and upward, who has been a citizen for ninety days, and has resided in the State for one year and in the county for four months is entitled to vote. Both male and female citizens enjoy equally all civil, political, and religious rights and privileges. All general elections, except for municipal and school officers, are held on the first Tuesday following the first Monday in November of the year in which the election is held. The use of voting machines is permitted. The United States Senators are elected at the general election held in November, beginning 1914.

Local and Municipal Government.—The unit of local government is the county. Elections are held biennially in each incorporated city and town on the first Monday in November, dating from 1911. In cities of first class there are elected a mayor, four commissioners, and an auditor. The mayor and commissioners are elected for a term of four years, and the auditor for two years.

Miscellaneous Constitutional and Statutory Provisions.—There is a board of labor conciliation and arbitration to safeguard the rights of the labor. There is a law making unlawful certain medicines containing opium, chloral, or alcohol. Employment of any children under the age of 14 in certain designated employments is forbidden. Restrictions are also placed on the employment of females under the age of 21. Indeterminate sentences are provided for persons convicted of crime. The Legislature of 1913 passed a measure providing for mothers' pensions. The State is divided into local option units. Each incorporated city and town is a separate voting unit. Each county outside of such cities and towns is a separate voting unit to determine whether liquor may be sold. There are heavy penalties provided for the shipment of liquor from "wet" to "dry" territories of the State.

Finances. The finances are in a satisfactory condition. At the time of admission into the Union the State assumed the small debt of the Territory, amounting to $700,000, and additional bonds to the amount of $200,000 were issued. For the year ending Nov. 30, 1915, the total receipts were $4,358,004 and the expenditures $4,889,893. The balance on hand on Nov. 30, 1914, was $1,366,482, leaving a balance of $834,953 on Nov. 30, 1915. The bonded debt at the close of the year amounted to $3,060,000.

Militia. The militia consisted, in 1915, of one battalion of infantry, one battery of artillery, and one troop of cavalry. The strength was represented by 546 enlisted men and 30 officers. In 1910 the number of men of militia age (18 to 44 years) was 84,449.

Population. The population of Utah by periods is as follows: 1850, 11,380; 1860, 40,273; 1870, 86,786; 1880, 143,963; 1890, 210,779; 1900, 276,749; 1910, 373,351; 1915 (estimated) 424,300. In 1910 it ranked forty-first among the States in population. The density per square mile in that year was 4.5. The urban population in 1910 was 172,934 and the rural 200,417. The number of males in that year was 192,118. The negro population numbered 1444, the Indian 3123, and the Japanese 2110. The native whites numbered 303,190 and the foreign-born whites 63,393. Of the natives, 64,475 were born outside the State, those coming from Illinois, Colorado, Iowa, and Idaho leading in order mentioned. Among the foreign born, the English with 18,082 were by far the most numerous; the Danes numbered 8300, the Swedes 7227, and the Greeks 4039. The males of voting age numbered 104,115 in 1910. The leading cities with their populations in 1910 and as estimated for 1915 were Salt Lake City 92,777 and 113,567, Ogden 25,580 and 30,466, and Provo 8925 and 10,368.

Education. The excellent educational condition of Utah is witnessed by the low percentage of illiteracy, which amounted to 2.5 in 1910; among whites of native parentage it was 0.4, and among foreign-born whites 5.9. According to the thirteenth census the school population was 104,876, ages 6 to 18 years. Of this 87,000 attended school. This is a higher rate than was found in any other State except Kansas. According to the report of the State Superintendent of Education the total school population in 1915 was 121,411. The total enrollment in the public schools was 97,000, and the average attendance was 82,804. There were 2111 female and 740 male teachers. Total school expenditures for the year were $5,206,746. The average salary paid female teachers in elementary schools was $71.75 per month, and male teachers $104.22. There were, in 1915, 44 high schools in which were enrolled about 8500 students. All schools outside the cities of the first and the second class are now organized into consolidated county districts. The Mormon church maintains an efficient educational system. In addition to the elementary schools the church sustains two colleges and eight academies. All these schools offer high-school courses. Three of the institutions, the Snow Academy, Brigham Young College, and the Brigham Young University offer work of college grade.

There are several excellent Roman Catholic academies and schools. These include All Hallows College in Salt Lake City and the Sacred Heart Academy at Ogden. Institutions of collegiate rank are the University of Utah (see UTAH, UNIVERSITY OF) and the Utah Agricultural College at Logan, both State institutions and both coeducational.

Charities and Corrections. The Mormon church has women's relief societies organized as the National Women's Relief Societies. Salt Lake City and Ogden have local charitable associations. The State maintains the State Mental Hospital at Provo, the State Industrial School at Ogden, the School for the Deaf and Blind at Ogden, and the State Penitentiary at Salt Lake City.

Religion. Utah is the centre of Mormonism. About three-fourths of its population is allied with the Mormon church. (See MORMONS.) In recent years many other denominations have entered the State, of which the Roman Catholics and Methodists are numerically the strongest.

History. The first white explorers of Utah were Spaniards, sent by Coronado (q.v.), who reached the Colorado River in 1540. Two Franciscan friars seeking a direct route to the Pacific went from Santa Fe to Utah Lake in 1776. In the winter of 1824–25, James Bridger, a trapper, seeking to determine the course of the Bear River, discovered the Great Salt Lake. Other trappers followed in 1825–26, and established posts in the region. Later immigrants to Oregon and California passed through without halting. The real history begins when the Mormons (q.v.), despairing of peace in Missouri or Illinois, determined in 1846 to move west. The Mexican War was then in progress, and in June, 1846, while the emigrants were encamped at the site of Council Bluffs, Iowa, a Mormon battalion was raised for the conquest of California, which then included the whole southwestern part of the United States. The march of the Mormon people was slow and painful. On July 21, 1847, the advance guard reached the present site of Salt Lake City. Other bands rapidly followed, and by 1852 they numbered 15,000. The United States did not obtain possession of the territory until the Treaty of Guadalupe Hidalgo in 1848, and did not immediately provide for its government. At first the church officers were the rulers, but with the coming of non-Mormons in 1849 the State of Deseret was organized, a constitution adopted, and a delegate sent to the United States Congress asking admission. Congress refused to admit the State, but organized the Territory of Utah (Sept. 9, 1850) with boundaries much more extended than at present, and Brigham Young (q.v.) was appointed Governor. He soon quarreled with the other Territorial officers sent out, and the General Assembly adopted the laws of the State of Deseret. In 1854 and again in 1856 admission to the Union was sought. There was constant wrangling, owing partly to the fact that many officers sent out were incompetent and partly because the authorities of the church were determined to rule at any cost. In 1857 it was determined that Young should be superseded as Governor, and for this purpose it was considered necessary to make a display of military strength, as Young had defied the authority of the United States. (See YOUNG, BRIGHAM.) For some years troops were kept in garrison at Salt Lake City. An act designed to break up polygamy was passed in 1862. Meanwhile the Perpetual Emigration Fund had been organized in 1849 and thousands of proselytes were brought from Europe. The incoming of non-Mormons was viewed with disfavor. See MOUNTAIN MEADOWS MASSACRE.

After the Civil War, the opening of the transcontinental railroad in 1869 brought more "gentiles," and further efforts to enforce the laws were made by some officers, but with little success. The Mormon grand juries refused to indict and the other juries to convict. The death of Young in 1877 apparently made no difference in the condition of affairs. It was finally decided that the only way to break the power of the church was to deprive its members of political power. The Edmunds Bill in 1882 disfranchised all polygamists, and abolished most of the offices in the Territory. Control was given to a commission of five men. Within two years 12,000 were disfranchised and the indignation was so great that troops were sent in 1885 in fear of an uprising. Continued agitation for statehood brought no result, and meanwhile, after it had been held constitutional that juries might consist entirely of non-Mormons, prominent officials were convicted and sent to the penitentiary. A more stringent act was passed in 1887, the corporation of the Mormon church and the Perpetual Emigration Fund were abolished and their property escheated. By 1890, 468 men had been convicted of polygamy, and President Woodruff of the Mormon church issued a manifesto declaring that the church no longer countenanced polygamy, and his action was approved by a general conference of the church. This was followed in 1891 by the formation of political parties on national lines, and in 1893 amnesty was declared to all offenders who could show that they had not broken the law since 1890. Congress passed an enabling act for statehood in 1894, a constitution was formed on March 6, 1895, was adopted in November, and the State was admitted Jan. 4, 1896. The constitution forbids polygamy and allows woman suffrage. Since admission it has been claimed that the people are going back to their old practices, and in 1900 Brigham H. Roberts was not allowed to take his seat in the United States House of Representatives because of a charge of polygamy. Similar opposition was manifested against Senator Reed Smoot, but in February, 1907, the Senate sustained his election.

In the election of 1908 the vote for President was: Taft, 61,015; Bryan, 52,601; Debs, 4895. William Spry was elected Governor by a majority of 9538 over his Democratic opponent. The Legislature reëlected Senator Smoot in 1909 and Senator Sutherland in 1911. Utah was one of the two States carried by Taft in the election of 1912. The vote was: Taft, 42,013; Wilson, 36,579; Roosevelt, 24,174. In that year Governor Spry was reëlected by a vote of 42,552 against 36,076 for Tolton, Democrat, and 23,591 for Morris, Progressive. In the election of 1914 Senator Smoot was again reëlected. The Legislature of 1915 passed a bill providing for Statewide prohibition, which was vetoed by Governor Spry after its adjournment.

In national politics the State voted for the Democratic silver candidate in 1896 but has been strongly Republican since 1900. See also Mormons.

GOVERNORS OF UTAH

STATE OF DESERET

Brigham Young	1849–51

TERRITORY OF UTAH

Brigham Young	1851–57
Alfred Cumming	1857–61
John W. Dawson	1861
Frank Fuller (acting)	1861–62
Stephen S. Harding	1862–63
James Duane Doty	1863–65
Charles Durkee	1865–69
Edwin Higgins (acting)	1869–70
S. A. Mann (acting)	1870
J. Wilson Shaffer	1870
Vernon H. Vaughan (acting)	1870–71
George L. Woods	1870–74
S. B. Axtell	1874–75
George B. Emery	1875–80
Eli H. Murray	1880–86
Caleb W. West	1886–89
Arthur L. Thomas	1889–93
Caleb W. West	1893–96

OF THE STATE

Heber M. Wells	Republican	1896–1905
John C. Cutler	"	1905–1909
William Spry	"	1909–

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UTAH, University of. A coeducational State institution for higher education founded in Salt Lake City in 1850. It was originally called the University of the State of Deseret. After one session it was discontinued until 1867, owing to a lack of funds and patronage. In 1891 a new charter was secured and the present corporate title was assumed. The university in the same year received a grant of 60 acres on the Fort Douglas Reservation, and the State Legislature in 1899 appropriated $200,000 for buildings on the new site. Congress in 1906 granted the university 32 additional acres on the Fort Douglas Reservation. The university comprises the School of Arts and Sciences, the State Normal School and School of Education, the State School of Mines, established by the State Legislature in 1901, a school of medicine, and a school of law. The attendance in all departments in the autumn of 1915 was 2191. The teaching force numbered 98, and the library contains 45,485 volumes and 19,075 pamphlets. The property of the university was valued in 1915 at $1,255,000, and the gross annual income at $245,000. The president in 1916 was J. F. Kingsbury, D.S.

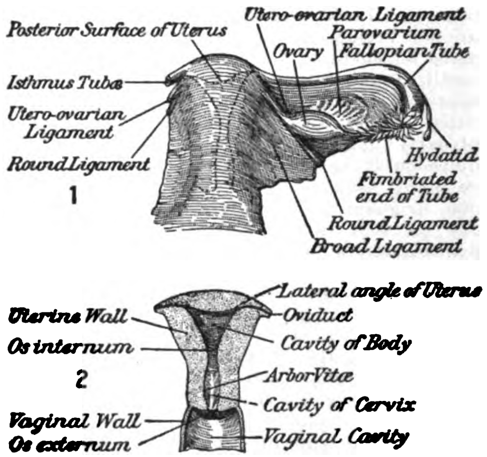
UTAH LAKE. The largest fresh-water lake in Utah, situated 30 miles southeast of the Great Salt Lake, into which it discharges through the river Jordan (Map: Utah, C 2). It is about 21 miles long, and its maximum width is about 11 miles, made by an extension to the east. Elsewhere its average width is about 5 miles. It lies on the extreme eastern border of the Great American Basin, at the western base of the Wasatch Range, and at an altitude of 4489 feet. It receives its principal drainage from the east.

UTAKAMAND. See Ootacamand.

UTAMARO, ōō'tȧ-mä'rō, Kitagawa (1753-54–1806). A Japanese engraver and designer of color prints. He was born at Kawagoye (Province of Musachi), and studied at Yedo (now Tokio) under the painter Toriyama Sekiyen and at the school of Kano. In 1776 he published his first book of woodcuts and about 1780 his first colored album. His fame spread rapidly, reaching as far as Holland, and he employed many assistants. Utamaro's work includes illustrations for poems and romances, landscapes, shells, insects, animals, and scenes from popular life, but his favorite subjects were women. He created a new fascinating type, but in his portrayal of courtesans and professional beauties followed the erotic tendency of his Japanese contemporaries. Among his most famous series are "The Twelve Hours of the Green Houses" (1804) and "Yamauba and Kintoki." His prints, which show an astonishing variety of technique, are characterized by subtlety of line, animated composition, and delicate transparent color. They are well represented in the Metropolitan Museum, New York. An excellent exhibition of his work was held at the Musée des Arts Décoratifs, Paris, in 1912. Consult the catalogue of this exhibition, compiled by Vignier and Tnada (Paris, 1912), also the monographs by Kurt (Leipzig, 1907) and Goncourt (Paris, 1911).

UTE, ūt, or **Ū'TAH.** An important tribe of Shoshonean stock (q.v.), who formerly occupied the mountain region of western Colorado and eastern Utah, with portions of the adjacent territory on the north and south, and extended their hunting and raiding expeditions far down into the plains. They were subdivided into bands, of which the principal were the Tabequache, Muache, Capote, Wiminuche, Yampa, and Uinta. They seem to have been the original nucleus of the Shoshonean stock, as commonly recognized, occupying a central position and having no tradition of any earlier home. They were usually at peace with their neighbors and kindred on the north and west, the Shoshoni, Banak, and Piute, and also assumed a protectorship over the Jicarilla, but carried on constant and relentless warfare with the Navajo and with all the tribes of the plains. They were a restless, warlike, and aggressive people, living entirely by hunting and on wild fruits and roots, and, like other tribes of the same stock, were democratic in their tribal life, with centralized or hereditary chiefship and careless of ceremonial. Their native arts were simple, but by trade with the Navajo and Piute they obtained blankets and baskets, while from the Mexicans and by raids on other tribes they procured herds of horses, sheep, and cattle. Their ordinary dwelling was a brush shelter or small tepee. The Ute made their first treaty with the government in 1850, and by various subsequent treaties were limited in range until the entire body, with the exception of the southern Ute, were removed to the present reservation in Utah. In the fall of 1906 the latter left their reserve and moved up to the headwaters of the South Fork of the Platte, refusing to return. As they were armed, a force of cavalry was sent out to force them back. When surrounded the Utes agreed to go to Fort Mead, S. Dak., to await orders from the Indian Department. They claimed that they could not live upon their reserve under the conditions imposed by the officials, and proposed to emigrate to the Big Horn valley. Later they returned to their reservation. In 1910 the total number of Utes was 12,244. See Plate of AMERICAN INDIANS, under INDIANS.

U'TERUS (Lat., womb), or WOMB. A flattened, pear-shaped organ, lying behind the symphysis of the pubes in the human female, and constituting her principal generative organ. It consists of a body, a base or fundus, a neck or cervix, and a mouth. It lies in the line of the axis of the outlet of the pelvis (q.v.), with base directed upward and forward, and the neck directed slightly backward. In the unimpregnated condition it is about three inches in length, two in breadth, and one in thickness. Its walls are nearly half an inch thick, and are mainly composed of muscle fibres running irregularly in all directions except round the os, where they make a partial sphincter. This muscular coat, which constitutes the bulk of the organ, is covered externally with a serous coat, derived from the peritoneum, and is lined internally by a mucous coat continuous with that of the canal called the vagina, by which the interior of the womb communicates with the outer surface of the body. The neck or cervix is distinguished from the body by a well-marked constriction. The mouth or os projects into the vagina. This opening is nearly round in the virgin and transverse after parturition. It is of considerable size, and is named the *os uteri externum;* it leads into a narrow canal which terminates at the upper end of the cervix in a smaller opening, the *os internum,* beyond which is the shallow triangular cavity of the womb, of which it forms the lower angle, while the two upper angles, which are funnel-shaped, constitute the beginning of the Fallopian tubes or oviducts, whose apertures are so small as only to admit the passage of a fine bristle. The blood vessels and nerves enlarge in a very remarkable way during pregnancy, so as to adapt themselves to the increased wants of the organ, which at the ninth month of uterogestation weighs from 2 to 4 pounds. The name "uterine appendages" or "adnexa" is given to the Fallopian tubes and ovaries, which are inclosed by the lateral folds of the peritoneum called the broad ligaments. The uterus is suspended in the pelvic cavity in such a way as, by its mobility, to escape concussion from without or disturbance from the varying conditions of the surrounding viscera, while at the same time to allow of its vastly increasing in bulk with comparatively little discomfort when pregnancy occurs. This is effected by several reduplications of peritoneum, known as the broad, the round, the uterosacral, and the uterovesical ligaments.



1, uterus and broad ligament as seen from behind, the latter being spread out. The isthmus tubæ, the utero-ovarian ligament, and the round ligament of the left side have been cut short. 2, sectional diagram of the uterine cavity as seen from the front.

The chief functions of the uterus relate to menstruation (q.v.), insemination, gestation, and parturition. See EMBRYOLOGY; FŒTUS; OBSTETRICS; OVARY; STERILITY; UTERUS, DISEASES OF THE.

UTERUS, DISEASES OF THE. The causes of uterine disease may be divided into those which are operative before marriage, those which arise during married life, and those which depend upon childbearing or its sequels. These causes thus embrace neglect of out-of-door life and physical development; improper dress; imprudence during menstruation; excessive mental strain; the prevention of conception and the production of abortion; the neglect of precautions after childbirth or the failure to repair lacerations occurring during delivery; disease communicated during sexual intercourse; and habitual constipation. Utter disregard of weather or temperature during menstruation and a continuance of the nervous tension of study during this period are grave and undermining agencies. Too great activity after parturition in women heretofore unaccustomed to physical labor interferes with the normal contraction of the enlarged uterus, a process requiring six weeks for its accomplishment. The modern obstetrician is prepared to close lacerations immediately after delivery, to complete the surgical repairs necessary, and to prevent infection through bleeding surfaces. A very fruitful source of uterine disease lies in the prevention of conception and the procurement of abortion. Retention of fœtal membranes, hemorrhage, septicæmia, peritonitis, are common and often fatal consequences. Gonorrhœa (q.v.) is a frequent and dangerous cause of uterine disease.

Endometritis is an inflammation of the mucous lining of the uterus, and may be confined either to the neck or the body of the organ or may affect both. It may be set up by exposure, injury, infection from the vagina (notably gonorrhœal), retained fœtal membranes, and many other causes. Its symptoms are pain, weight, and oppression in the pelvic cavity and in the back, and an irritating leucorrhœal discharge.

Chronic metritis or hyperplasia is often coincident with endometritis and gives rise to similar symptoms. The pathological condition present is an enlargement of the uterine walls through increase of connective tissue.

Laceration of the cervix of the uterus consists of a tearing in the wall of the neck of the organ during labor. It gives rise to all the symptoms noted under endometritis, and sometimes to neuralgic pains in the uterine region and discomfort in walking. It may be unavoidable during delivery, and most frequently occurs as a result of precipitate labor, or manual or instrumental delivery. It is a frequent cause of lifelong suffering and distress, which operative interference, in the vast majority of cases, relieves at once.

Displacement of the uterus, while not a disease, gives rise to diseased conditions of much moment, by preventing the escape of menstrual blood, by interfering with the uterine circulation, by causing pressure and friction, and by producing sterility. The varieties of displacements are anteflexion, in which the uterus is bent forward upon itself; anteversion, in which the whole uterus is tilted forward; retroversion, in which the uterus is tilted backward; retroflexion, in which the uterus is bent backward upon itself; lateroversion and lateroflexion, in which the uterus is tilted or bent upon itself sideways; inversion, in which the fundus of the uterus is turned partly or entirely inside out; and prolapsus, or descent, in which the uterine body slips downward, and even, in the worst degree, causes a protrusion of the cervix at the vulvar orifice.

Menorrhagia is a condition in which menstruation is profuse, and an actual hemorrhage occurs at the menstrual period. Metrorrhagia is the occurrence of profuse menstruation or of a hemorrhage from the uterus in the interval between menstrual periods.

Cancer of the uterus is fairly frequent. The symptoms are pain through the pelvis; tenderness upon walking or moving, or during coition; hemorrhage; discharge of a very offensive fluid from the uterus; pallor and loss of strength and flesh. The treatment is complete removal of the organ and its adnexa. Consult Kelly and Noble, *Gynecology and Abdominal Surgery* (Philadelphia, 1916).

U'THER. King of Britain and father, by Igerna, of Arthur (q.v.).

U'TICA (Lat., from Gk. *Οὐτική*, *Outikē*, *'Ιτυκή*, *Itykē*). An ancient city of Africa, at the northwest extremity of the Gulf of Tunis, and about 20 miles from the city of Tunis. It was one of the oldest Phœnician settlements on the African coast, though the traditional date of its foundation (about 1100 B.C.) seems to rest on no good evidence. Like the other Phœnician cities, it acknowledged the supremacy of the Carthaginians, though its position was rather that of ally than subject. It was captured by Agathocles (q.v.) in his invasion of Africa at the beginning of the third century B.C., and played an important part in the Punic Wars. Early submission to Rome in the Third Punic War was rewarded with a large share of Carthaginian territory. In the war between Cæsar and Pompeius it became famous as a rallying point of the Pompeians after the battle of Pharsalus, being occupied by Cato. At Utica Cato committed suicide after Cæsar's victory at Thapsus. Utica became a free city under Cæsar and it received further privileges from Augustus. It was destroyed by the Arabs towards the end of the seventh century. The few ruins visible above ground lie west of the river known to the ancients as Bagradas. In 1869 A. Daux, a French engineer, made important excavations, by which he located the amphitheatre, capable of holding 20,000 spectators, the theatre, baths, reservoirs, the aqueduct, the fortifications, acropolis, quays, etc. (Consult A. Daux, *Le tour du monde*, 1872.) The site of the city was anciently on the shore about 27 Roman miles northwest of Carthage, but on account of changes in the coast line, caused by the river Bagradas, the spot is at present inland.

UTICA. A city and the county seat of Oneida Co., N. Y., 95 miles west by north of Albany, on the south bank of the Mohawk River, on the State Barge Canal, and on the New York Central, the New York, Ontario, and Western, the Delaware, Lackawanna, and Western, the Adirondack and St. Lawrence, and the West Shore railroads. It is also on the Utica and Mohawk Valley Electric Railroad (Map: New York, E 4). It is finely situated at an elevation of about 430 feet, and is regularly laid out. Noteworthy are the city hall, the courthouse, the United States Government building, the State Armory, the Munson-Williams Memorial, home of the Oneida Historical Society, the Young Men's Christian Association building, the Young Women's Christian Association building, the high school, the Savings Bank of Utica, the Utica Free Academy, and the State Masonic Home. The public library has 84,000 volumes. Other collections include the Oneida Historical Society Library, with more than 7200 volumes, the Utica Law Library, the Utica State Hospital Medical Library, the Young Men's Christian Association Library, the East Utica Library, the Deutscher Leserverein, and the Faxton Hall Library. Utica has been termed "the city of charities" because of the number of its charitable institutions, the value of their property, and the large amount annually expended for their maintenance. The more important of these institutions include the Home for the Homeless, Home for Aged Men and Couples, Utica Orphan Asylum, St. Vincent's Industrial School, St. John's Orphan Asylum, House of the Good Shepherd, and the City, Homœopathic, Faxton's, St. Luke's, and St. Elizabeth's hospitals. A State lunatic asylum also is here.

Utica is of considerable prominence as a commercial and industrial centre. It is in a rich dairy-farming country and is widely known for its large output of cheese. Hop growing and the cultivation of roses are other important industries of the surrounding district. In manufacturing Utica ranks eighth among the cities of the State, its various industrial establishments according to the 1914 census having $30,762,000 invested capital and a production valued at $30,490,000. There were 306 establishments, employing 14,368 persons. The leading manufactures are men's clothing, hosiery and knit goods, cotton and woolen goods, steam fittings and heating apparatus, foundry and machine-shop products, malt liquors, lumber products, firearms, metal beds, cutlery, farm implements, paints, fire extinguishers, automobile parts, office furniture, and saddlery and harness. For maintenance and operation the city spends annually about $1,510,000. The chief items are: schools, $422,000; fire department, $178,000; police department, $87,000; interest on debt, $90,000; street lighting, $81,000; street cleaning, $63,000. The net debt in 1915 was $2,400,000; and the assessed valuation of property (real and personal) was $51,000,000. Pop., 1820, 2972; 1880, 33,914; 1900, 56,383; 1910, 74,419; 1915 (State census), 80,589.

Utica was settled about 1786 on the site of Fort Schuyler. Until 1798, when it was incorporated as a town under its present name, Utica was known as "Old Fort Schuyler." It received a city charter in 1832. Its growth was slow until after the completion of the Erie Canal in 1825. Consult: Bagg (editor), *Memorial History of Utica* (Syracuse, 1892); and Brown, Butcher, and Goodale, *Outline History of Utica and Vicinity* (Utica, 1900).

UTIEL, o͞o-tē-äl′. A town of Valencia, Spain, 45 miles west of the city of Valencia. The principal manufactures are wine, brandy, silk and linen fabrics, and pottery. Municipal pop., 1900, 11,560; 1910, 11,777.

UTIL′ITA′RIANISM (from *utilitarian*, from *utility*, from Lat. *utilitas*, usefulness, profit, from *utilis*, useful, from *uti*, to use). The name of the theory of ethics (q.v.) that adopts, as the criterion of right and wrong, of good and bad, the tendency of an action to produce the greatest happiness of the greatest number. John Stuart Mill claims to have coined the word, which was suggested to him by the use of the term "utilitarian" in Galt's *Annals of the Parish*.

The doctrine of utility is generally opposed to all those theories that refer us to some internal sense, feeling, or sentiment, for the test of right and wrong; a test usually described by such phrases as a moral sense, conscience, innate moral distinctions, whence utility is sometimes termed the external or objective standard of morality. It is also opposed to the view that founds moral distinctions on the mere arbitrary will of God. Again, it is opposed to the view that the pleasure-giving value of an act to the agent is the test of its goodness or badness (individualistic hedonism).

The utilitarian theory is distinctively a modern theory. All ancient hedonisms were more or less individualistic; i.e., the happiness of the agent and not that of his fellow beings was regarded as the ultimate end of all rational action. This is true even of Christianity in so far as it is hedonistic, for the ultimate appeal in Christianity is to the individual's desire for everlasting happiness, although along with this appeal is another to a benevolent desire for the happiness of one's neighbors. In the Greek hedonistic systems whatever regard is paid to the well being of others is in the last analysis based on the fact that such consideration for others brings pleasure to one's self. In modern times Hobbes is the foremost representative of this ancient or individualistic hedonism. Hutcheson (q.v.) is perhaps the first writer on ethics who advocated the principle of the greatest happiness of the greatest number, in this way transcending the limitations of egoism (q.v.). There are utilitarian tendencies in Hume (q.v.) and even in Locke. Abraham Tucker (q.v.) is also to be mentioned as one of the early Utilitarians (1705–74). But Paley (q.v.) and Bentham (q.v.), especially the latter, are to be credited with giving such popular expression to this view that it became current in all centres of English thought. In Paley, however, utilitarianism was combined with theological authoritarianism and with individualistic hedonism, as is shown in his notorious definition of virtue as "the doing good to mankind, in obedience to the will of God, and for the sake of everlasting happiness." With Bentham the theory was used as a foundation, not merely of ethics, but also of political and legal reforms. Having in view the necessity of sacrificing smaller interests to greater, or, at all events, of not sacrificing greater interests to smaller, he described the ethical end as "the greatest happiness of the greatest number." He illustrated the doctrine by setting it in opposition to asceticism, and to sympathy and antipathy. Asceticism he interpreted to mean the principle that pleasure should be forfeited, and pain incurred, without expectation of any compensation. By the principle of sympathy and antipathy he means "the principle which approves or disapproves of certain actions, not on account of their tending to augment the happiness, nor yet on account of their tending to diminish the happiness of the party whose interest is in question, but merely because a man finds himself disposed to approve or disapprove of them: holding up that approbation or disapprobation as a sufficient reason for itself, and disclaiming the necessity of looking out for any extrinsic ground." According to the utility principle of Bentham, there are "four sanctions or sources of pain and pleasure," the physical, the political, the moral, and the religious. The physical sanction is the groundwork of all the others. "In a word, the powers of nature may operate of themselves; but neither the magistrate, nor men at large, can operate, nor is God in the case in question supposed to operate, but through the powers of nature." Bentham attempted to work out a calculus of pleasures, in which he took account of the intensity, the duration, the certainty, the propinquity or remoteness, the fecundity (= "chance of being followed by sensations of the same kind"), the purity, and the extent of pleasures and pain.

John Austin, in his *Province of Jurisprudence Determined*, has contributed a lucid exposition and a strong defense of the principle of utility. John Stuart Mill has devoted a separate work to the subject, and may be considered as the ablest champion of the doctrine since Bentham's time. His addition to the theory consists in recognizing a distinction of quality as well as of intensity between pleasures. While Bentham had maintained that, "the quality of pleasure being equal, push-pin is as good as poetry," Mill contended that "it is better to be a human being dissatisfied than a pig satisfied," i.e., human discontent is better than swinish pleasures. Since Mill's day utilitarianism has been combined with the theory of evolution to form a basis for morality. Among the English advocates of the combination the best known are Herbert Spencer (q.v.) and Sir Leslie Stephen (q.v.).

The objections urged against hedonism (q.v.) in general bear against utilitarianism. In addition there are arguments which tell against utilitarianism exclusively. Utilitarianism is not practicable for the reason that it is impossible to estimate the pleasures which in the long run will flow from any course of action. Human nature changes very radically in its capacity to get pleasures from certain objects. Time was when the cruel torturing of a captured enemy brought intense delight to a whole tribe, and was regarded with complete indifference by the rest of mankind, with the exception of the victim's fellow-tribesmen. Now such treatment of captives would shock all Christendom. Many jokes and jests that centuries ago were appreciated with great relish would fall flat now in good society, and some of them would inflict considerable discomfort upon the hearers. Gladiatorial combats and bull fights are differently regarded at different times and places. These are only a few of the large number of instances which might be adduced to show how impossible it is to foresee the hedonic effect of actions when a distant future is taken into account. The uncertainties of calculation are great enough when only the pleasure of the agent is concerned (see HEDONISM), but if the pleasures of all mankind, present and future, so far as they are in any way affected by our actions, must be estimated before we can properly pronounce upon the morality of any act, then moral judgment becomes impracticable. The reply to this objection is that while there is no accurate forecasting of pleasures we must make the best estimates possible, or, to use the words of Bishop Butler, "probability is the guide of life."

Perhaps, however, the limitations of utilitarianism can be made most patent by asking the question, Why should I seek the greatest pleasure of the greatest number? Unless I desire that end for itself or desire it because the attainment of it conduces to some other desired end, it would be impossible to make me regard that end as good or the pursuit of it as right. The savage is not cosmopolitan in his ethics (hence he is not utilitarian), because he is not cosmopolitan in his sympathies. The normal civilized man is not uniformly cosmopolitan in his ethics (hence he is not a utilitarian), because he is not uniformly cosmopolitan in his sympathies. The average good man cares more for his father and mother, for his wife and children, than he does for strangers. For this reason he does not regard the happiness of a stranger as equally obligatory upon him to pursue as the happiness of some member of his immediate family. But when this ordinary man undergoes an unusual change of heart and comes to care more, say, for the opinion some supernatural being is supposed to have of him than for his own kith and kin, then in order to win that good opinion he may sacrifice the happiness of his family to that of strangers. It is not true, therefore, that we should be benevolent because only thus can we secure the greatest happiness of the greatest number; but, on the contrary, we try to make "the greatest happiness of the greatest number" an end because we are benevolent. But our benevolence is only a part of our endowment, varying in relative intensity in different persons, and in the same person at different times. In addition to our desire for the well-being of others we have an almost countless number of desires for other objects. The realization of these desires enters into the question of the chief end of man. There is no reason why one desire should be singled out from the complex of desires in order that its realization may be considered the highest good of man—unless this desire is the most imperious of them all and its nonsatisfaction conduces more to the agent's discontent with life than any other cause. Now there is no question that without some social features the life of most human beings would be robbed of much of its attractiveness, but there is very little evidence to show that the ordinary man would be greatly disturbed for a long time by any failure on the part of humanity at large to get the greatest amount of happiness possible. And yet, though universal benevolence is not thus a very strong characteristic of our kind at large, still history seems to show that the reach of the average man's sympathetic interests is larger now than in tribal times. But, however much greater it may be now than formerly, free play given to one's impartially benevolent impulses can hardly be regarded as the highest good of all men.

Bibliography. Hutcheson, *Inquiry Concerning the Original of our Ideas of Beauty and Virtue, etc.* (London, 1725); Tucker, *Light of Nature Pursued* (ib., 1768–74); Jeremy Bentham, *Introduction to the Principles of Morals and Legislation* (ib., 1789); F. E. Beneke, *Grundlinien des natürlichen Systems der praktischen Philosophie* (3 vols., Berlin, 1837–40); Alexander Bain, *The Emotions and the Will* (London, 1859); George Grote, *Examination of Utilitarian Philosophy* (Cambridge, 1870); Auguste Comte, *Positive Philosophy* (2d ed., 2 vols., Edinburgh, 1875); T. H. Green, *Prolegomena to Ethics* (Oxford, 1883); Henry Sidgwick, *Methods of Ethics* (4th ed., London, 1890); Friedrich Paulsen, *A System of Ethics* (New York, 1899); Halévy, *L'Evolution le la doctrine utilitaire de 1789 à 1815* (Paris, 1901); Ernest Albee, *History of English Utilitarianism* (New York, 1902); J. S. Mill, *Utilitarianism, Liberty, and Representative Government* (new ed., London, 1910); W. E. H. Lecky, *History of European Morals* (new ed., 2 vols., ib., 1910); Leslie Stephen, *The English Utilitarians* (new ed., 3 vols., London, 1912). See also ETHICS.

UTILITY. A term used by economists to signify the capacity of a good, whether article or service, to satisfy a want. The utility of a good under given circumstances is subjectively measured by its desirability under those circumstances or by the strength of the desire for it. The term is sometimes used as synonymous with good, as anything which satisfies a want is a good or a utility. In such a statement no question of moral values is raised; regardless of whether a desire is morally good or bad, that which satisfies it has utility. The fact that the intensity of desire for a good decreases as the number of units of the good increases is known as the law or principle of diminishing utility. Thus a second unit has less utility than the first, the third less than the second, and so on. The total utility then is the sum of the utilities of the successive units of the supply. But paradoxical as it may appear, this does not prevent the units of supply under specific and unchanging circumstances from being interchangeable and therefore equal to each other in utility, for though thus interchangeable the law of diminishing utility still applies to their consumption. The utility attaching to the last unit purchased under given circumstances is known as the marginal utility. See VALUE.

UT'MA. The ancient name of the Italian city Udine (q.v.).

UTO'PIA (Neo-Lat., from Gk. *οὐ*, *ou*, not + *τόπος*, *topos*, place). An impracticable scheme of social regeneration, an imaginary state of society, an ideal country where all things are perfect. The term as thus used goes back to the *Utopia* of Sir Thomas More (q.v.), a political romance descriptive of a happy society on an imaginary island. This work originally appeared in Latin at Louvain in 1516 under the title *De Optimo Reipublicæ Statu deque Nova Insula Utopia* and was translated into English by Bishop Burnet. The romance was a disguised exposition of a liberal and rationalistic theory of society, including certain principles that would now be called socialistic. Far from being so unique that it might have been expected to give a generic name to ideal commonwealths, the *Utopia* is only one of a long series of similar dreams. First in order of both time and importance is Plato's *Republic*, the chief thought of which is that ideal justice can be established only in a commonwealth where every individual has that place in the division of labor for which he is fitted by nature, and where all affairs are directed by the men of superior wisdom, whose government should extend even to provision for the nurture and education of children brought into the world under a system of stirpiculture. Plutarch's *Life of Lycurgus* idealizes the socialistic state of the Spartans. Bacon's *New Atlantis* (1624–29) pictures a commonwealth in which all men attain happiness through a regulation of life by science. Campanella's *City of the Sun* (1637) portrays a community where all live together in public buildings, working only four hours a day, and despising idleness. Very different in its ideal of society is James Harrington's *Oceana* (1656), a book which emphasizes the Aristotelian idea of a natural aristocracy among men, and develops fully the thought of personal liberty established under parliamentary government. It exercised a great influence upon the minds of American political thinkers during and after the Revolution. Other Utopias more or less influential have been the *Voyage en Salente* in Fénelon's *Télémaque;* Cabet's *Voyage en Icarie* (1840), a Utopia of the modern proletariat; Bulwer Lytton's *The Coming Race* (1871); Bellamy's *Looking Backward* (1889); William Morris's *News from Nowhere* (1890), in which joy in beautiful work is to be the true social bond; and Hertzka's *Freiland* (1891). Some of the more important works mentioned, excepting Plato's *Republic*, and the nineteenth-century romances, are reprinted in Morley's *Ideal Commonwealths* (1886).

U'TRAQUISTS (from Lat. *utraque*, nom. pl. neut. of *uterque*, both, either). The name given to certain reformers of the early fifteenth century, who maintained that the Eucharist should be administered "under both forms," i.e., that the cup, as well as the wafers, should be given to the laity. The movement was a part of the general reform preached by John Huss (q.v.; see HUSSITES) in Bohemia; it also had political features. The Utraquists represented the moderates, against the radical Taborites, and were identical with the Calixtines (q.v.).

UTRECHT, ū'trĕkt, *Dutch pron.* ụ'trĕкt. A province of the Netherlands, bounded by the Zuider Zee and the provinces of North Holland, Gelderland, and South Holland (Map: Netherlands, D 2). Area, 534 square miles. It lies mainly in the Rhine basin and has a low, level surface. Agriculture, dairying, and cattle breeding are the principal industries. Pop., 1909, 289,918; 1912, 298,367. Capital, Utrecht (q.v.).

UTRECHT. A city of the Netherlands, capital of the province of the same name. It is situated 22 miles by rail southeast of Amsterdam (Map: Netherlands, D 2). The Rhine separates here into the Old Rhine and the canalized Vecht, and there are also canals traversing the city. Utrecht is a strong outpost of defense for Amsterdam. Besides an inner line of defensive works there is an outlying chain of forts. The site of the former fortifications surrounding the city are (since 1830) lined by water courses and agreeable promenades. Quaint houses and artistic street scenes are to be seen at every hand, the Gothic being freely in evidence. The famous Gothic cathedral of St. Martin (1254–67), rising in the centre of the town, is the most prominent edifice, and marks the spot where the church of Dagobert and of St. Willebrord stood. It ranked high for architectural beauty until the nave, which has never been restored, fell in in 1674 as the result of a storm, thus separating the tower from the rest of the church. The tower, 338 feet high, was begun in 1321. It has a chime of 42 bells. The graceful Gothic cloisters which merit notice connect the cathedral with the famous university. (See UTRECHT, UNIVERSITY OF.) The Roman Catholic cathedral of St. Catharine, which has been restored, dates from 1524. The Pope's house, built in 1517 by Adrian Boeyens, afterward Adrian VI, a native of Utrecht, now contains municipal offices. The splendid archiepiscopal museum is noteworthy for its rare vestments, embroideries, carvings, etc., all representative of Christian art. The Museum Kunstliefde is in the building of the Society of Arts and Sciences, and contains a few notable pictures by Scorel. The art industrial Museum van Kunstnyverheid, the Fleshers' Hall (1637), and the mint possess some interest. On the east extends the Malieban—a triple boulevard shaded by six rows of large old lime trees. It leads to Hoogeland Park, and to the Antiquarian Museum, which is housed in an edifice of Greek pattern. The museum contains many varieties of antiquities belonging to Roman, Germanic, and mediæval times. The interesting royal Château of Soestdyk, where the reigning family often sojourns, is a few miles to the north.

Besides the university with its numerous collateral institutions, including laboratories and a museum, Utrecht has the only veterinary school in the Netherlands, and an important meteorological observatory. The Historical Society and the Society of Arts and Sciences hold a leading rank. The large university library is in the palace erected for King Louis Napoleon. The military hospital was founded by Napoleon I. Utrecht has manufactures of cloth, woolens, silk, velvet, carpets, carriages, organs, cigars, chemicals, etc. The communal population at the end of 1912 was 122,853. About one-third of the inhabitants are Catholics. In addition to the Roman Catholic archbishop, Utrecht is the seat of an old Catholic (Jansenist) archbishop.

History. Utrecht was the Roman *Trajectum ad Rhenum.* The bishopric of Utrecht, founded at the close of the seventh century by St. Willibrord, rose to importance under the patronage of the German emperors, and the bishops became prominent in their capacity as temporal princes among the feudal lords of the Holy Roman Empire. The city of Utrecht, having become very flourishing, succeeded in emancipating itself from the rule of the bishops. In 1528 the bishopric and city passed into the possession of the Emperor Charles V. In 1559 the see was elevated to the rank of an archbishopric. The Union of Utrecht, a compact joining together the seven provinces which were to form the Dutch Republic, was concluded in 1579. The famous Treaty of Utrecht, terminating the War of the Spanish Succession, was signed here in 1713. Consult Karl Hegel, *Städte und Gilden der Germanischen Völker,* vol. ii (Leipzig, 1891).

UTRECHT, Peace of. The general designation for a number of treaties which were concluded between the years 1713 and 1715 and brought to an end the War of the Spanish Succession. (See Succession Wars.) On April 13, 1713, peace was signed at Utrecht between France on the one hand and England, Holland, Prussia, Savoy, and Portugal on the other. Spain concluded treaties with England July 13, with Savoy August 13, with Holland June 26, 1714, and with Portugal Feb. 6, 1715. The treaty between France and Austria was signed at Rastadt March 7, 1714, and this was adhered to by the Empire at Baden in September. The most important provisions of the various treaties were as follows: Philip V, of the house of Bourbon, was recognized as King of Spain and the Indies, but it was stipulated that the crowns of Spain and France should never be united in the same person. Spain ceded to the Emperor, Naples, Milan, Sardinia, and the Netherlands; to England, Gibraltar and Minorca; to Savoy, the island of Sicily; to Prussia, Upper Gelderland. France surrendered its hold on Lorraine and gave up Kehl, Breisach, and Freiburg on the right bank of the Rhine, but retained Alsace with Strassburg. To England it ceded Acadia, Hudson's Bay, and Newfoundland, with the reservation of certain rights of fishery on the Banks. Louis XIV recognized the title of the house of Hanover to the English throne, and agreed to expel the Pretender from France. The Electors of Cologne and Bavaria, allies of France, were restored to their possessions. The Dutch were given the right of garrisoning eight frontier towns in the Austrian Netherlands as a barrier against any future aggressions on the part of France. Their commercial interests were favored by the provision which kept the Scheldt closed to trade. The Prussian King received confirmation of his royal title and the Duke of Savoy was raised to the kingly dignity. (See Sardinia, Kingdom of.) England, in addition to its conquests from France and Spain, received from both valuable trading privileges, and in the so-called Assiento (q.v.) with the latter laid the basis of an extremely lucrative slave trade with Spanish America. The Peace of Utrecht effected the most important political rearrangement in Europe between the Peace of Westphalia and the Congress of Vienna. Though France received far more favorable terms than it might have been forced to accept, Europe was secured from its ambitions by the aggrandizement of its neighbors, Austria and Holland on the north, Prussia on the east, and Savoy on the southeast. With Utrecht the last two Powers definitely entered upon the line of development which was to result in a united Germany and a united Italy in the nineteenth century. From Utrecht dates England's marvelous commercial and colonial growth. Consult *Histoire du congrés et de la paix d'Utrecht comme aussi de celle de Rastatt et de Bade* (Utrecht, 1716).

UTRECHT, University of. A national university of the Netherlands, founded in 1636 upon the basis of a "schola illustris," established two years earlier by the city and province of Utrecht. During the French occupation in 1672 the university was closed. It was reopened in 1674 with only 22 students, which number, however, increased to about 230 by the early part of the eighteenth century. Nearly one-third of the students came from Great Britain. The university experienced another decline of fortune in 1811–13, as a result of the Napoleonic conquest, but has flourished since its reopening as a royal university in 1815. (For its place in the national system of education, see the section on the *Netherlands* under University.) It is divided into five faculties—theology, law, medicine, mathematics and science, and letters—and had, in 1912–13, 1096 students. There are 21 laboratories and clinics, and an observatory, in connection with the university. The library contains about 250,000 volumes, exclusive of pamphlets and dissertations.

UTRERA, ōō-trā′rȧ. A town of the Province of Seville, Spain, 17 miles southeast of the city of that name, with which it has railway connection (Map: Spain, C 4). The town is situated in a fertile plain sloping to the Guadaira River. It has manufactures of spirits, flour, and soap. Parts of its mediæval walls are still standing. Pop., 1900, 14,318; 1910, 15,460.

UTSUNOMIYA, ōōt′sṳ-nô-mē′yȧ. The capital of the Prefecture of Tochigi, Japan, 66 miles north of Tokio (Map: Japan, F 5). Pop., 1908, 47,114.

UTUADO, ōō-twä′ᴅô. A municipality of Porto Rico in the Province of Arecibo, 18 miles north-northwest of Ponce on the highway from Arecibo to Ponce (Map: Porto Rico, C 2). The city is situated in a district abounding with caves in which have been found relics of the early Indians. The cultivation of coffee and sugar cane is the chief industry. There is a municipal hospital and a public library. The municipality was founded in 1739. Pop., 1910, 41,054.

UVALDE, ū-văl′dĕ. A town and the county seat of Uvalde Co., Texas, 91 miles by rail southwest of San Antonio, on the Leona River, and on the Galveston, Harrisburg, and San Antonio and the San Antonio, Uvalde, and Gulf railroads (Map: Texas, C 5). Fort Inge, an army post of Indian days, is 2 miles distant. Pop., 1900, 1889; 1910, 3998.

UVAROVITE, ōō-vä′rŏf-ĭt. See Garnet.

U'VA UR'SI. Bearberry. A plant indigenous to the Northern Hemisphere, growing in dry rocky places and found in the eastern United States as far south as Pennsylvania, and in New Mexico and California. Its botanical name is *Arctostaphylos uva-ursi*, of the natural order Ericaceæ. The leaves are used in medicine in the form of an extract and fluidextract, as a diuretic, astringent, and disinfectant to the urinary mucous membranes. It is given in pyelitis, cystitis, and gonorrhœa, and also in dropsical conditions. The chief constituents of uva ursi are arbutin and ericolin, bitter glucosides, and ursone, tannic acid, and gallic acid.

UVEDALE. See Udall.

U'VULA. See Palate.

UX'BRIDGE. A town in Worcester Co., Mass., 19 miles south-southeast of Worcester, on the Blackstone River, and on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, D 4). It has granite quarries, and cotton, yarn, and woolen mills. Pop., 1900, 3599; 1910, 4671.

UYEDA, o͞o'yȧ-dȧ. A town in the Prefecture of Nagano, Japan, situated in the central part of Hondo, 21 miles southeast of Nagano (Map: Japan, F 5). It manufactures chiefly silks. Pop., 1908, 23,838.

UYUK, o͞o-yo͞ok'. A noted archæological site in Asia Minor. See Eyuk.

UZ (Heb. ‘*uṣ*). The land of the patriarch Job, and probably also the name of his people. In Job i. 3 he is said to be one of the Bene Kedem, an Aramaic people living east of the Dead Sea and the Arabah (see Kadmonites). In Lam. iv. 21 the "land of Uz" appears as a synonym of Bath Edom, "the daughter of Edom." According to the colophon in the Greek version Job "lived in Ausitis in the borders of Idumæa and Arabia," and the same statement is found in the *Peregrinatio Sylviæ* and in a passage from Aristeas quoted by Eusebius (*Præp. Ev.*, ix, 25). Uz appears as the eponymous ancestor of an Aramaic tribe in Gen. x. 23 (oldest son of Aram), and in Gen. xxii. 21 (oldest son of Nahor, brother of Buz). The representation of Uz as a descendant of Seir (Gen. xxxvi. 28) probably indicates only that this Aramaic tribe lived in the territory of Mount Seir. The names and homes of the friends of Job point in the same direction. Eliphaz of Teman, a district in Edom, appears in Gen. xxxvi. 4 as a son of Esau. Bildad, the Shuhite, may be identical with Bedad, the father of Hadad, the third King of Edom (Gen. xxxvi. 35), and Shuah was regarded as an uncle of Sheba and Dedan (modern el Ula). Zophar, as the Greek text shows, was a son of Eliphaz (Gen. xxvi. 11, 15), and Na‘amah is likely to be a transposition of Ma‘an, rendered Minaean by the Greek. Elihu came from Buz, which is associated with Dedan and Teima in Jer. xxv. 23. If, as the Greek translator thinks, Job is identical with Jobab, the second King of Edom, Gen. xxxvi is clearly the quarry drawn upon in the Book of Job, and the land of Uz is a part of the ancient Edomitish territory, easily exposed to raids from the city of Sheba and by the Aramaic tribe Kesed. Josephus speaks of Ouses as the founder of Trachonitis and Damascus (*Ant.*, i, 6, 4); Arabic geographers localized the city of Job at Nawa, and his house, Der Ayyub, not far from Nawa; and this region has also been assumed to be the home of Job by Wetzstein and Barton. But Dhorme has convincingly shown that this implies a transfer of the story from the Edomitish Dinhaba, the city of Jobab, to the Dinhaba of the Hauran. The mistaken notion that there could be no Aramæan tribes as far south as in the region occupied by the Aramaic-speaking Nabatæans probably also had something to do with this change. Consult: P. J. G. Wetzstein, in Franz Delitzsch, *Hiob* (2d ed., Leipzig, 1876); also references under Uz (article following).

UZ (Heb. ‘*uṣ*). 1. The eponymous ancestor of an Aramaic tribe, represented as the oldest son of Aram in Gen. x. 23, as the oldest son of Nahor and brother of Buz in Gen. xxii. 21. In Gen. xxxvi. 28 Uz is a descendant of Seir; this statement possibly affirms that the Aramæan tribe occupied a part of the territory of the Horites, or cave dwellers, in Mount Seir. Buz is mentioned with Dedan and Teima in Jer. xxv. 23; Dedan is apparently the modern el Ula; Teima still exists in the same neighborhood; Buz, therefore, is likely to have been in northern Hejaz; and Uz seems to have been an Aramæan tribe in the border of Edom and Hejaz. 2. The home of Job (i. 1). He is said to be one of the Bene Kedem. The Kedem tribe, or Kadmonites (q.v.), lived east of the Dead Sea and the Arabah, and were Aramæans. Eliphaz, the friend of Job, came from Teman in S. Edom; Bildad, another friend, from Suah, who appears as an uncle of Sheba and Dedan; Zophar, the third friend, from Na‘amah, or Ma‘an (in Greek Minaean); and Elihu from Buz. It is also to be noted that Eliphaz appears in Gen. xxxvi. 4, as a son of Esau; Zophar in Gen. xxxvi. 11, 15, according to the Greek version, as a son of Eliphaz; and Bildad apparently, in the abbreviated form Bedad, as the father of Adad, King of Edom, in Gen. xxxv. 35. In the Greek version Job is said to have lived in Ausitis in the border of Idumæa and Arabia; the same statement is found in the *Peregrinatio Sylviæ*, and in a passage from Aristeas quoted by Eusebius. The idea that the Aramæans lived farther north probably led Josephus to speak of Ouses as the founder of Damascus and Trachonitis, and Arabic geographers to localize the city of Job at Nawa, and the house of Job not far from there. Barton assumes that neither Sabæans nor the Chaldæans originally occurred in the text, but only "captors" and "horsemen," and that Uz was in the Hauran; Dhorme more plausibly thinks of the city of Sheba and the tribe of Kesed as the enemies falling upon Job's property and locates Job on the borders of Edom and Arabia. It is not improbable that the land of Uz was the territory in this region occupied by the Aramaic tribe of Uz. Consult: P. Dhorme, "Le pays de Job" in *Revue Biblique Internationale* (Paris, 1911); Nathaniel Schmidt, in *Messages of the Poets* (New York, 1911); G. A. Barton, "The Original Home of the Story of Job," in *Journal of Biblical Literature* (Boston, 1912).

UZ, o͞ots, Johann Peter (1720–96). A German poet, born at Ansbach and educated at Halle, where he became the friend of Gleim and Götz. He was in his day prominent in the group of German anacreontic poets. His works include *Sieg des Liebesgottes* (1753), *Versuch über die Kunst stets fröhlich zu sein* (1760), and *Poetische Schriften* (1804). Consult: Feuerbach, *Uz, ein biographischer Versuch* (Leipzig, 1866); Henneberger, *Briefe von Uz an einen Freund aus 1753–1782* (Leipzig, 1866); Petzet, *Johann Peter Uz* (Ansbach, 1896).

UZANNE, ṳ′zȧn′ (Louis) Octave (1852–). A French bibliophile and littérateur, born at Auxerre. He founded the monthly review *Le Livre,* which he edited (1880–89), and then *L'Art et les Ideés* (1892). He was one of the original members of the Society of Contemporary Bibliographers established in 1889. His best work includes: *Caprices d'un bibliophile* (1877); *La chronique libertine du XVIIIe siècle* (1879–83); *Les zigzags d'un curieux* (1889); *Notes pour la bibliographie du XIXe siècle* (1894); *Contes pour les bibliophiles* (1895); *Dictionnaire bibliophilosophique* (1896); *L'Art dans la décoration extérieure des livres en France et à l'étranger* (1898); *L'Art et les artifices de la beauté* (1902); *Les deux Canaletto, biographie critique* (1907); *L'Egypte contemporaine* (1909); *Parisiennes de ce temps* (1910); *Le célibat de l'amour* (1912).

UZ′BEKS, or **US′BEGS.** A people of the Oxus basin in Russian Turkestan, scattered from the frontiers of the Chinese Empire to the Caspian. They are in part nomadic, but have settled in great numbers in the towns and villages. By language they belong to the Turkic stock, but they have a considerable strain of Iranian blood and possess many elements of Asiatic Aryan culture. The early home of the Uzbeks is generally considered to have been about the northern end of the Caspian Sea, whence they spread as conquerors in the sixteenth century over Balkh, Khiva, Bokhara, Ferghana, and Khokand.

UZENSK, Novo. See Novo-Uzensk.

UZZIAH, ŭz-zī′ȧ (Heb. *'Uzziyyāh* or *'Uzziyāhū,* Yahwe is my strength), or Azariah (Heb. *'Azaryāh* or *'Azaryāhū,* Yahwe helps). A king of Judah, son of Amaziah (2 Kings xv. 1–7; 2 Chron. xxvi). The relation of the two names is uncertain. They may be practically synonyms, double names occurring in the Davidic line, or possibly one is a textual corruption of the other. Uzziah is assigned a reign of 52 years, but seems to have reigned himself only 40 (c.777–737 B.C.). The Book of Kings simply recounts his piety, and that he was smitten with leprosy in the latter part of his reign, his son Jotham becoming Regent. The Chronicler represents Uzziah as a successful warrior, subduing the Philistines, and driving back the Arabians and Ammonites, and so extending his boundaries southward. He added to the fortifications of Jerusalem, fortified the Negeb (q.v.), and zealously developed the royal domains. The stroke of leprosy is represented as due to the pride created by his success; he is said to have arrogated to himself the right to offer incense in the temple, and, when he persisted against the high priest, to have been stricken with the plague. Uzziah was the contemporary of Jeroboam II (q.v.) of Israel. Isaiah records that his prophetic vision came in the year Uzziah died. Consult the histories of Israel quoted in the article on Jews.

UZZIEL, Jonathan ben. See Jonathan ben Uzziel.

V

V The twenty-second letter and seventeenth consonant of the English alphabet. Its form corresponds to the Roman V, which answers to the Greek upsilon (Υ, υ), and that in turn was a variation of the Phœnician Y (*vau*). (See ALPHABET.) In Latin *v* and *u* were used indifferently to represent either the consonantal or the vocalic sound. See U.

Sound and Philological Value. As a phonetic character *v* in modern English is a voiced labiodental spirant. Its corresponding voiceless character is *f*. The sound is produced by the breath passing between the lower lip pressed against the upper teeth. The philological sources of the letters are various. When not initial, Eng. *v* may represent (1) Indo-Ger. *bh*, as in Eng. *love*, Ger. *liebe*, Skt. *lubh*, to desire; (2) Indo-Ger. *p*, as in Eng. *over*, Ger. *über*, Skt. *upari*. In a few words initial *v* in English represents Indo-Ger. *p* = AS. *f*, as in *vat*, AS. *fæt; vane*, AS. *fana; vixen*, AS. *fixen*. In these cases *v* is due to the influence of the Southern English dialect which gave a voiced sound regularly to the older English *f*. Often initial *v* in English is a sign of a loan word from Latin or French, as in *villa, voice, vacation*.

As a Symbol and Abbreviation. V in chemistry = *vanadium*. In Roman numerals V = 5; $\overline{V}$ = 5000. *v* = Lat. *vide*, see. See PHONETICS.

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VAAL, väl (Dutch, yellow, a partial translation of the native name *Kai Gariep*, yellow river). The chief tributary of the Orange River in South Africa, regarded by some as the true upper course of the main stream. It rises on the west slope of the Drakensberg, flows west and southwestward on the boundary between the provinces of Transvaal and Orange Free State, and joins the Orange in the Province of the Cape of Good Hope after a course of between 500 and 600 miles (Map: Cape of Good Hope, J 6).

VĀC, or **VACH**, väch (Skt., word, voice). In Hindu mythology, the personification of speech, later identified with Sarasvati, the divine embodiment of eloquence and learning and wife of Brahma (q.v.). She is celebrated in one late hymn of the Rig-Veda as the conferrer of life, wealth, and power on mortals. A later meteorological interpretation regards her as "the voice of the midair" or the thunder. Certain attempts have been made to compare Vac as "the divine word" with the Logos (q.v.), or Word of the Fourth Gospel, but any parallelism between them is due merely to accidental coincidence. Consult: Hopkins, *Religions of India* (Boston, 1895); id., *India Old and New* (New York, 1901); Macdonell, *Vedic Mythology* (Strassburg, 1897); Müller, *Six Systems of Indian Philosophy* (New York, 1899).

VACA, vä'kȧ, ALVAR NÚÑEZ CABEZA DE. See NÚÑEZ CABEZA DE VACA.

VACANDARD, vȧ'käɴ'dȧr', ELPHÈGE (1849–). A French Church historian. He was born at Melleville and became a priest and doctor of theology. He wrote: *Saint Bernard* (1877); *Abélard, sa lutte avec Saint Bernard* (1881); *Vie de Saint Bernard* (1895; new ed., 1910), crowned by the French Academy; *La confession sacramentelle dans l'église primitive* (1903); *L'Inquisition* (1907; Eng. trans., new ed., 1915); *Etudes de critique et d'histoire religieuse* (3 series, 1905–12).

VACARESCO, vä'kȧ-rĕs'kô, HÉLÈNE (ELENA VACARESCU) (1866–). A Rumanian poet and novelist. Born at Bucharest, she came of a family notable in letters since the middle of the eighteenth century. She received part of her education in Paris, and for a time, as maid of honor to Queen Elizabeth (Carmen Sylva), resided at the Rumanian court. After 1892 she lived mostly in Paris. Her *Chants d'aurore* (1886) was crowned by the French Academy, as was also *Le rhapsode de la Dâmbovița* (1900), a collection of Rumanian folk songs translated into French. This appeared in an English translation by Carmen Sylva and A. Shettell as *The Bard of the Dimbovitza* (new ed., 1902). For *L'Ame sereine* (1896) she was awarded the Jules Favre prize by the French Academy. Her writings also include: *Lueurs et flammes* (1903); *Kings and Queens I Have Known* (1904); *Songs of the Valiant Voivode and Other Strange Folklore* (1905); *Le jardin passionné* (1908); *Amor vincit* (1909); *Royal Lovers: The Adventures of Two Empresses* (1909).

VACATION SCHOOL. A term used, quite arbitrarily, to indicate a school kept in many American cities during the customary summer vacation for the children of the public schools. The term has no reference to the more advanced schools connected with universities and colleges or with popular educational institutions such as the Chautauqua (q.v.), though the motive for the establishment of these more advanced schools may be much the same. The vacation school is of very recent establishment, save in a few isolated instances, and owes its origin to the work of philanthropic societies in caring for the children of the poor of the larger cities during the extreme heat of the summer. While there are sporadic instances of such schools kept by these societies as early as 1866, when the old First Church in Boston conducted one, and there are even some instances of school boards providing for such work, as in Newark, N. J., in the same year, the movement has become of importance only since 1898, when the Board of Education of the city of New York took over the schools primarily founded by the Society for the Improvement of the Condition of the Poor. During 1913–14 that city provided 213 play centres of different kinds and 36 vacation schools, the former with an average daily attendance of 140,168 and 27,107 at the latter. At the present time all the large cities of the country and many of the small ones, to the extent of some 200 in all, support such schools. The work of the vacation school is of a much more practical nature than that of the ordinary session and is devoted more to constructive work and organized play by the child. Consequently manual training, housekeeping, sewing, together with nature work, local history, and geography, combined with excursions, form a prominent part of the curriculum. During the last few years, however, work of more serious character has been introduced in the upper grades and in the high schools to enable backward pupils to catch up with their work, or more ambitious pupils to make more rapid progress. The idea of vacation schools is being fostered and has met with success in London through the efforts of Mrs. Humphry Ward. Consult C. A. Perry, *Wider Use of the School Plant* (New York, 1910).

VAC′CINA′TION (from *vaccine*, from Lat. *vaccinus*, relating to a cow, from *vacca*, cow; connected with Skt. *vaśā*, cow, from *vāś*, to bellow, or perhaps with *ukṣan*, bull). Inoculation with *vaccinia* or cowpox, to protect the individual against smallpox.

History. Many years before the time of Jenner it was observed in widely separated localities that accidental infection with cowpox conferred immunity against smallpox. Immermann quotes Von Humboldt as referring in his travels in the tropics (1803) to the fact that native shepherds in the Mexican Cordilleras believed in the protection afforded by vaccinia against smallpox, and quotes Brun as making a similar statement in reference to the clan of Elihots in Baluchistan. Peasants in different parts of Europe, especially in the southern part of England, in Holstein, Mecklenburg, Hanover, and Saxony were firmly convinced of the fact. It was known to most Oriental peoples, from whom the idea was introduced into England by the communications of Tinsoni and Pilarini to the Royal Society in 1713, and was taken up by Sir Hans Sloane four years later. In 1721 Lady Mary Montague had her five-year-old daughter inoculated in England, probably the first European to receive preventive vaccination, while Dr. Zabdiel Boylston inoculated his son and two negro slaves in Boston in the same year. In the smallpox epidemic in Boston in 1752, 2000 people were inoculated. In 1763 Dr. Heim, of Saxe-Meiningen, learned through his father, a clergyman, that milkmaids of that country neighborhood asserted their belief in the protective influence of accidental vaccinia against variola. The English physicians Sutton and Fewster inoculated with human smallpox in 1764 nearly 20,000 people during an epidemic in England. Medical men paid but little heed to their reports, and apparently further experiments were not made by them. A Gloucestershire farmer, Benjamin Jesty, inoculated successfully his wife and two sons with bovine virus in 1774. It is further reported that Platt, a school teacher near Kiel, vaccinated two children with bovine virus to protect them from an epidemic of smallpox in 1791. But great and lasting credit is no less due to Edward Jenner (q.v.), who in 1778 began a thorough scientific investigation of the matter, and placed the performance of vaccination in its proper place among prophylactic procedures. His experiments were very numerous and accurate. The first mention of individuals occurs in the history of the inoculation on May 14, 1796, of the eight-year-old James Phipps with vaccine virus from a vesicle on the person of a milkmaid, Sarah Nelwes, who had accidentally acquired cowpox. This was probably the first vaccination of a patient with humanized virus of the first generation. A typical case of cowpox developed in Phipps, and subsequent attempted inoculation with smallpox virus proved negative. Jenner followed this experiment with an inoculation with bovine virus, and then inoculated from individual to individual for five generations, securing perfect immunity from smallpox in all patients and collecting data of 23 cases. When both facts were established he put forth his remarkable publication, *An Inquiry into the Causes and Effects of the Variolæ Vacciniæ, Known by the Name of the Cowpox* (1798). This work was translated into Latin and all the European languages, and excited much attention, as well as opposition. Vaccinations were frequent and numerous, and many representative and noted physicians declared themselves as advocates of the theory and practice, in England, France, Austria, Italy, Germany, Switzerland, Holland, Norway, Sweden, Russia, Spain, and Portugal, while others, especially in England, opposed him. Jenner founded, in 1803, the Royal Institute for the Extermination of Smallpox, which he directed for many years. Both institutions vaccinated people free of charge and supplied virus for other countries. To Luigi Sacco, a physician of Milan, is due credit, second only to Jenner's, for a life-long service in behalf of preventive vaccination, equine and ovine inoculation, and retro-inoculation. To Sacco the world owes the final adoption of animal (bovine) virus in place of humanized virus.

Statistics of the Utility of Vaccination. Statistics prove indubitably that a population vaccinated and revaccinated thoroughly can remain practically immune from smallpox. One of the earliest opportunities for proving, on a large scale, the value of vaccination, occurred during the pandemic of smallpox which raged in Europe from 1870 to 1873. The greater part of the German army had been vaccinated in childhood, and all of it again vaccinated upon entering service in the Franco-Prussian War. In the French army, regular vaccination had not been practiced, and revaccination had been neglected. The mortality in the German army was 450, or 58 men to every 100,000; in the

French army the mortality was 23,400. Statistics might be multiplied indefinitely, but they all show the same result. The experience of the United States health authorities in the Philippine Islands is another case in point. With the exception of an occasional sporadic outbreak, the islands have been free from smallpox since vaccination was enforced. In the United States and England epidemics have occurred from time to time, but in every instance they have been shown to be due to laxity in the enforcement of the law, or to opposition on the part of certain sections of the community.

Technique of Vaccination and Course of Vaccinia. Virus for vaccination should be procured from well-developed typical vaccine pocks on the abdomen of a healthy young heifer, while they are still in the vesicular stage. The virus may be received upon ivory points or removed entirely by scraping it from the underlying corium with a spoon, and rubbing this mass with glycerin. The resulting emulsion of pulp is much more active than the dried lymph. It is conveniently kept in sealed capillary tubes. Both the collection of virus and its application to the patient should be done under strict aseptic conditions. Usually the arm or leg is chosen for the place of vaccination, and should be thoroughly cleaned and disinfected. Two or three shallow scarifications are made with as many crossing them, the surgeon cutting as deeply as the derma without necessarily drawing blood. After the lymphatic fluid begins to flow from these incisions the vaccine virus is rubbed into the incisions. A sterilized toothpick flattened at one end is a convenient implement for this purpose. After drying thoroughly, the surface is covered with a layer of sterile gauze, which is to remain on for three days. In the course of three to seven days elevated papules appear, oval or oblong, over the scarifications. These papules are firm, hot, and tender. They are surrounded by a red halo or areola. About the fifth day after their appearance they become vesicles, containing clear fluid, which is vaccine lymph. When humanized virus was used, this was taken from the patient to be used in inoculating another case. These vesicles are called Jenner's vesicles, and somewhat resemble the vesicles of smallpox. Like them, also, they shrink and become umbilicated after the seventh or ninth day; the halo grows darker; pus takes the place of the lymph; pain, itching, swelling, and heat are troublesome. A slight reaction consisting of fever and malaise may take place on the fifth day. About the ninth or tenth day the pustule dries, and a crust forms. The areola fades. The axillary glands may enlarge at this time and are tender and painful on pressure. Children's symptoms are more pronounced than those of adults. The temperature during vaccinia reaches 102.5° F., and rarely runs higher. The crust separates from the arm in 14 days. If the crust be detached by scratching or the chafing of the clothing a second one forms. In all cases scrupulous care must be exercised lest the wound become infected with germs in dust or clothing, or under finger nails. Serious consequences follow such infection. The wound may be infected with erysipelas, or gangrenous inflammation may set in, causing a very large ulcer. These are not the results of the vaccination, but of subsequent infection; and the same results are often seen following any scratch with a needle or an abrasion upon the hand.

Danger of Vaccination. There is no danger in proper vaccination, if infection is avoided thereafter. All inflammatory reaction beyond that described as occurring in the course of regular vaccinia is due to the introduction of microorganisms by means of dirty instruments or through the admission of dust. There is absolutely no danger of transmitting disease by means of bovine virus. When humanized virus was used there was some danger of transinoculating with syphilis or tuberculosis. Yet even this danger was remote. Tetanus has followed vaccination, not from the operation itself but from subsequent infection.

Compulsory Laws. Naturally, vaccination, in order to protect, must be universal. All foci from which the disease might spread must be destroyed, and immunity must be secured round about each focus. Every child should be vaccinated during its first year, and all adults from foreign countries should be vaccinated, unless they present sufficient evidence of successful protection previously. Several years after Jenner's discovery, public interest was aroused to a complete understanding of the necessity of compulsory vaccination. Bavaria established a law making vaccination compulsory in 1807. Other states of the North German Confederation followed, and between 1815 and 1832 similar statutes were enacted in Oldenburg, Baden, Württemberg, Saxe-Gotha, Saxe-Meiningen, and Brunswick. Austria in 1801 made vaccination compulsory for school children, but not generally so till 1886. In 1816 Prussia also enacted an indirectly compulsory law. Sweden's compulsory law was put upon the statute books about 1803. Norway and Denmark followed in 1810. After many vicissitudes and changes, Great Britain's law was enacted in 1867. Scotland put herself on record in 1864. Italy, Holland, and Belgium popularized vaccination very early and needed no law. France's decree of 1809 was inoperative and the country has suffered heavily from the want of a compulsory law. The German Empire framed the Imperial Vaccination Law in 1874, and its provisions deserve study and imitation. It provides: (1) Every child shall be vaccinated within the calendar year of its birth, unless it has passed through an attack of variola. (2) Every pupil shall be revaccinated when 12 years of age, if he has not had variola within the past five years. (3) Every vaccinated person must present himself to the physician who vaccinated him between the sixth and eighth day after vaccination. (4) Medical certificates proving successful vaccination at the legal ages shall be preserved by parents and guardians.

In the United States the laws regarding compulsory vaccination vary greatly in the different States. Vaccination is made compulsory by law only in Kentucky, the Philippine Islands, and Porto Rico. In Kentucky the law requires the vaccination of all children within 12 months after birth and all minors and adults are to be vaccinated. In the Philippine Islands every child, three months of age, must undergo vaccination and all inhabitants must be vaccinated as often as required by the health authorities. In Porto Rico the board of health requires that every person shall possess a certificate of vaccination. Massachusetts enacted laws to regulate vaccination in 1809. Several States followed the example early, notably Rhode Island. In most of the States local or State boards of health formulate regulations under which vaccination is practically compulsory, acting in unison with school boards in excluding all unvaccinated children from the schools. In several of the United States the constitutionality of statutes making vaccination compulsory has been judicially settled. They are held to be a legitimate exercise of the police power for the protection of the public health. A physician who vaccinates a person without the latter's consent, but who is acting under the authority of such a statute or ordinance, is not liable for assault. For a fuller account of vaccination requirements in the United States, consult The International Year Book, 1912.

In spite of the testimony received from all over the civilized world, antivaccinationists flourish in small bodies here and there. The antivaccination sentiment had become so strong in England, although confined to a small class, that a measure was adopted in 1898 practically annulling the compulsory vaccination bill of that country. The newer measure provides that any parent may refuse to have his child vaccinated and avoid legal penalty if he satisfies the court that he has conscientious scruples as to the benefits of vaccination. The agitation against vaccination has been constant since the days of Jenner. In his time it was claimed that the tendency of the inoculation of vaccinia was to cause bovine characteristics to appear in children; that they developed horns, hoofs, and tails, and bellowed like cattle. Less absurd but, in the opinion of leading medical authorities, equally untenable arguments are presented against vaccination to-day.

Revaccination. Jenner believed that the effect of vaccination was perennial; and this belief imperiled the progress of vaccination at one epoch in its history, for vaccinated persons, after several years of immunity, fell victims to smallpox. At one time the mystical number seven seemed to rule the mind, and vaccinia was said to last seven years. In fact, the duration of immunity conferred by vaccination is variable in different people. In a few cases, one vaccination protects for life, and cannot be successfully repeated. In others, a vaccination will take every time it is tried. A number of investigations as to the duration of immunity have thrown some light on the matter. These were based on the percentage of successful revaccinations. Kitasato of Tokyo found that revaccination was successful in 14 per cent after one year; 33 per cent after two years; 47 per cent after three years; 57 per cent after four years, and so on until 10 years was reached, when 89 per cent of the persons were successfully revaccinated and therefore had probably lost their immunity. Somewhat similar results were obtained by Lescohier of Detroit, in 500 cases. He found that 34 years after primary inoculation revaccination was practically always successful. King, in 1913, in observations made on Asiatics, found that in a series of 312 patients who had been vaccinated before 15 years of age, revaccination was successful in 80.3 per cent. It may be taken as a safe rule that immunity in a large percentage of persons is practically lost 10 years after primary vaccination and that it begins to diminish from the second year. See Cowpox.

Substitutes for Vaccination. It has been asserted from time to time by enthusiasts in sanitation that cleanliness and disinfection will control and prevent smallpox. This is an error. Until the microörganism causing smallpox is discovered and its nature is known, no adequate prophylactic or disinfectant measures will supersede vaccination. Were primary vaccination and revaccination carefully practiced, smallpox would be entirely eradicated. See Smallpox.

Bibliography. Willan, *Vaccine-Inoculation* (London, 1807); Sacco, *Trattato di vaccinazione* (Milan, 1809); Baron, *The Life of Jenner* (London, 1827); Borne, *Vaccination et revaccinations obligatoires en application de la loi sur la protection de la santé publique* (Paris, 1902); C. K. Millard, *The Vaccination Question* (London, 1914); A. C. Klebs, "Historic Evolution of Variolation," in *Bulletin of Johns Hopkins Hospital*, vol. xxiv (Baltimore, 1915).

VACCINATION FOR TYPHOID. See Hygiene, *Military Hygiene*.

VAC'CINE THERAPY, Bacterin Therapy. Bacterial vaccines, as defined by Sir Almroth Wright (q.v.), are "sterilized and enumerated suspensions of bacteria which furnish, when they dissolve in the body, substances which stimulate the healthy tissues to a production of specific bacteriotropic substances which fasten upon and directly or indirectly contribute to the destruction of the corresponding bacteria."

The use of bacterial vaccines in combating diseases of bacterial origin is based on the principle that the injection of killed bacteria increases the bactericidal power of the blood by stimulating the production of antibodies, these in the main constituting the defensive mechanism of the body against zymotic diseases. The immunity which a vaccine confers differs from that given by a serum in being active instead of passive. The materials from which vaccines are prepared may be derived from various pathological fluids of the body which contain the offending organisms. Cultures may be made from the nasal secretion, from pus cavities, discharging ears, from sputum, from the urine, and from the blood. These specimens must be as nearly as possible uncontaminated by extraneous organisms. Cultures are made by spreading the material upon suitable media, preferably those containing blood or serum and having a solid consistency. The further process of preparing the vaccine consists in mixing the resultant culture (generally a 24-hour growth) with normal salt solution, to which is added a preservative, such as phenol, and agitating the emulsion to secure uniform mixture. A mechanical shaker is used for this purpose and from a half to one hour is necessary to complete emulsification. The mixture is standardized by means of an ordinary blood counter, so that a given number of bacteria, usually from 100,000,000 to 1,000,000,000, are contained in each cubic centimeter. Finally, the bacteria are killed by exposure to a temperature of 140° to 150° F. for about an hour. The vaccine is now drawn off into sterile glass containers and is then ready for use. Vaccines made directly from the secretions of a given patient are termed *autogenous* and are as a rule more efficacious than stock vaccines, these being cultures made from extraneous sources. Stock vaccines, however, particularly when polyvalent, i.e., containing several strains of the bacterium, are more generally used and give good results. Vaccines are administered by hypodermic injection, the skin being previously sterilized with alcohol or iodine. They are most effective in localized suppurating lesions of the skin, such as abscess, acne, furunculosis and carbuncle, especially when these are in a subacute or chronic state. They are also of value in deep-seated pus affections, such as pyelonephritis, cystitis, osteomyelitis, etc.; in specific affections of the joints, such as gonorrheal arthritis and in many affections of the eyes, ears, and nose. Tuberculin (q.v.) is discussed under its own title. Bacterin therapy is contraindicated in all diffuse infections characterized by septicæmia or pyæmia, and in severe acute diseases, such as pneumonia and typhoid fever, when the body is already overwhelmed by the bacterial invasion. In general the presence of fever is a contraindication. The prophylactic value of certain vaccines is well exemplified in typhoid fever (q.v.), where a very efficient degree of immunity is conferred by protective doses of antityphoid vaccine. See Serum Therapy; Tuberculin. Consult Gould and Pyle, *Cyclopedia of Medicine and Surgery* (Philadelphia, 1912), and J. A. Kolmer, *A Practical Text-Book of Infection, Immunity, and Specific Therapy* (ib., 1915).

VACCINOTHERAPY. See Vaccine Therapy.

VACH, văch. See Vāc.

VACHELL, văch′*e*l, Horace Annesley (1861–). An English novelist, educated at Harrow and at the Royal Military College, Sandhurst. His fiction includes, notably: *The Romance of Judge Ketchum* (1894); *Quicksands of Pactolus* (1896); *The Procession of Life* (1899); *John Charity* (1900); *The Pinch of Prosperity* (1903); *Brothers* (1904); *The Hill* (1905); *The Face of Clay* (1906); *Her Son* (1907); *The Other Side* (1910); *John Verney* (1911); *Bunch Grass* (1912); *Quinneys'* (1914); *Spragge's Canyon* (1914). *Her Son* and *Quinneys'* were dramatized, the latter being produced in New York in 1915. Other plays by Vachell were *Searchlights* and *Lady Camber* (both 1915).

VACHEROT, vȧsh′rō′, Etienne (1809–97). A French philosopher, born at Langres and educated in Paris. In 1837 he was appointed superintendent of the Ecole Normale by Victor Cousin, his former teacher, whom he succeeded as professor of philosophy at the Sorbonne in 1839. His liberal views and especially the exposition of his philosophical doctrines in the *Histoire critique de l'école d'Alexandrie* (1846–51) aroused the violent opposition of the clergy. He was suspended from his position of superintendent and, after denying allegiance to the Empire in 1852, was deprived of his professorate. Judiciary proceedings and imprisonment resulted from the publication of *La démocratie* (1859). As mayor of the fifth arrondissement of Paris he rendered important services during the siege and the Commune and in 1871 was elected to the National Assembly, where he at first sided with the Liberals, but afterward joined the Centre and even lent his support to the Broglie ministry in its ultramontane aspirations. Although he withdrew from political life after the dissolution of the National Assembly, he continued to voice sensationally anti-Republican opinions in the *Revue des Deux Mondes*, the *Figaro*, and the *Soleil*. Besides his principal work, *La métaphysique et la science* (2d ed., 1863), containing the development of his philosophical system, he wrote *Essais de philosophie critique* (1864), *La religion* (1868), *La science et la conscience* (1870), *La politique extérieure de la république* (1881), *Le nouveau spiritualisme* (1884), *La démocratie libérale* (1892). For his biography, consult Ollé-Laprune (Paris, 1898).

VACOA. See Screw Pine.

VACQUERIE, vȧk′rē′, Auguste (1819–95). A French author and journalist, born at Villequier. He showed himself an ardent admirer of Hugo, and endeavored to practice the tenets of romanticism as expressed by the great writer in his *Preface to Cromwell*. His utterances as editor of *Rappel*, an anti-Imperial journal, were several times made the subject of court proceedings. Beginning with poetry, *L'Enfer de l'esprit* and *Les demi-teintes* (1845), Vacquerie later wrote the following plays: *Tragaldabas* (1848), a failure; *Drames de la grève* (1855); *Les funérailles de l'honneur* (1861), a seven-act Romantic drama; *Jean Baudry* (1863); *Les fils* (1866). His *Théâtre complet* appeared in 1879. Vacquerie's work is vividly imaginative.

VACUUM, văk′ū-ŭm. See Air Pump.

VACUUM CLEANER. A mechanical device for removing, by means of air suction, dirt, dust, and other fine matter from carpets, upholstery, walls, and other surfaces. The device consists essentially of a nozzle to be passed over the material to be cleaned, a pipe connecting the nozzle with a separator where the dust and dirt are removed from the air, and an apparatus for producing a vacuum. The nozzles are of various sizes and forms, according to the use for which they are intended, such as cleaning carpets on the floor, or removing the dust from books on a shelf. The exhausters that produce the vacuum are of various types. There are three kinds of plants in general use: One small, portable, and compact, electrically driven by being connected to a lamp socket. Another, permanently mounted on a vehicle and driven by an internal-combustion engine, is drawn up at the curb and a hose led into the building to be cleaned. The third is a permanent installation, usually located in the basement of a building and connected by built-in pipes with outlets where a hose and nozzle may be attached in the various rooms and halls.

David T. Tenney of New York is credited with installing the first pure vacuum system in 1902, and about 1905 Dr. William Noe of San Francisco constructed the first portable vacuum cleaner. Consult M. S. Cooley, *Vacuum Cleaning Systems* (New York, 1913); N. S. Thompson, *Mechanical Equipment of Federal Buildings* (New York, 1915).

VACUUM PROCESS. See Refrigeration.

VA′DIA′NUS, Joachim (1484–1551). A Swiss reformer and humanist, whose real name was Von Watt. He was born in Saint-Gall, was educated there and in Vienna, and became instructor in classics at the University of Vienna in 1514. He returned to Saint-Gall in 1518 to practice medicine. But his great work there was as a reformer and a friend of Zwingli, and it was largely due to his influence that Saint-Gall in 1525–27 went over entirely to the Protestant church. He took a prominent part in the religious colloquies of Zurich (1523), and of Bern (1528), and corresponded with Luther and Erasmus. He wrote a *Chronicle* of the abbey of Saint-Gall, edited by Götzinger with Vadianus' other German works (1875–77), and a *Commentarius in Pomponium Melan* (1518). Consult: Geilsius, *J. v. Watt als geographischer Schriftsteller* (Winterthur, 1865); Preffel, *J. Vadian* (Elberfeld, 1861); and Götzinger, *J. v. Watt* (Halle, 1895).

VADIMO′NIAN LAKE (Lat. *Vadimonius Lacus*). A small circular lake in Etruria, now Lago di Bassano. It is famed as the scene of two Roman victories over the Etruscans: the first in 309 B.C. under the dictator Papirius Cursor, the second in 283 B.C. under the consul Dolabella.

VADSÖ, vädsʹē̆. A town on the northeast coast of Norway (lat. 70° 4′ N., long. 19° E.). Located on the shores of Varanger Fiord and on Vandö Island, it is attractive considering its high latitude, with a mean yearly temperature of 33° F. It has a town hall, schools, residences for civil and military officials, and five fish-oil refineries. It engages in extensive fisheries in the Atlantic and in the Arctic, in coastwise shipping, and in summer in shipping to Russia. It exports fish and fish products, guano, skins, game, and reindeer meat. Vadsö dates from 1567. Pop., 1910, 3322.

VADUZ, văʹdu̧ts. The capital of the Principality of Liechtenstein. It is charmingly situated near the right bank of the Rhine, at an elevation of 1525 feet, and is on the Feldkirch-Buchs branch of the Austrian State Railway. It is near the Three Sisters (6880 feet). The town has a Gothic parish church and a castle, which, destroyed by the Swiss in 1499, was rebuilt in 1523–26. The tower of the castle dates from the ninth century. Pop., 1912, 1376.

VAGA, văʹgȧ, Perino del (1500–47). An Italian decorative painter. He was born in Florence, was perhaps a pupil of Ghirlandaio or Fra Bartolommeo, and certainly of Raphael, whom he assisted in Rome in the stucco and arabesque decorations of the Loggia of the Vatican. He also executed some of the scriptural subjects there, and the figures of the planets in the great hall of the Appartamento Borgia. After the sack of Rome in 1527 he went to Genoa, where he decorated the Doria Palace with stuccoes and frescoes in a style similar to that adopted by Giulio Romano at Mantua, with subjects from classical fables. Later he returned to Rome, where he designed a number of façades, hall and church frescoes, and with Daniele da Volterra decorated the Sala Reggia in the Vatican.

VAGANTES, vȧ-gănʹtēz (Lat., wanderers). The name given to the itinerant students and clerics of the twelfth and thirteenth centuries, indistinguishable often from the wandering minstrels and clowns who form so picturesque a feature of mediæval life. They are known for the body of satirical literature in Latin which they created, commonly designated as Goliardic literature (q.v.).

VAGARSHAPAT, vȧ-gärʹshȧ-pȧt. A village of Russia. See under Etchmiadzin.

VAGIʹNA (Lat., sheath). One of the sexual organs in the female. It is a sheath from 4 to 7 inches long, into which open the uterus and the urethra. It lies behind the bladder and in front of the rectum, and it is lined with mucous membrane. Its external opening is called the vulva, which is formed by the apposition of the two *labia majora.*

VAGLIERI, vȧl-yâʹrḗ, Dante (1865–1914). An Italian classical scholar, born at Triest. He studied at Triest and at the University of Vienna. From 1893 to his death he was connected, in various capacities, with the University of Rome. He had charge also for some years of the important excavations at Ostia (q.v.), which he prosecuted with such energy and skill that Ostia now rivals Pompeii as a source of information concerning ancient Roman life.

VAGRANT. In law, a term of broad application including, in general, all idle and disorderly persons who may become a menace to the public peace or a public burden. The statutes in Great Britain and the United States differ in details, but are elastic enough to cover such diverse classes as unlicensed peddlers, beggars, drunkards, fortune tellers, prostitutes, notorious criminals, etc., as well as the specific tramp (q.v.).

VAʹGUS NERVE. See Pneumogastric Nerve.

VAHLEN, väʹlen, Johannes (1830–1911). A German philologist, born in Bonn, where he studied at the university, and became privat-docent in 1854. In 1856 he was made professor in Breslau, in 1858 at Vienna, and in 1874 in Berlin. Among his writings are to be noted especially: *Ennianæ Poesis Reliquiæ* (1854; 2d ed., 1903); *Nævii de Bello Punico Reliquiæ* (1854); *Ueber die Annalen des Ennius* (1886); *Ulpiani Liber Regularum* (1856); *Cicero de Legibus* (2d ed., 1883); a critical edition of Aristotle's *Poetics* (3d ed., 1885); *Lorenzo Valla* (2d ed., 1870); *Laurentii Vallæ Opuscula* (1869); and many articles in periodicals. For several years he was coeditor of the periodical *Hermes*, and also of the *Zeitschrift für österreichische Gymnasien.* Since his death his miscellaneous papers have been published in *Opuscula Academica* (2 vols., Leipzig, 1907). Consult J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

VAI. See Vei.

VAIGATCH, vī-gächʹ (Waigatz). An island in the Arctic Ocean belonging to the Russian Government of Archangel, between the mainland and Nova Zembla (Map: Russia, J 1). It is separated from the latter by the Kara Strait, and from the mainland by the Yugor (Waigatz) Strait, while its east coast is washed by the Kara Sea. It is about 70 miles long and 25 miles wide, with an area of 1400 square miles, and is traversed lengthwise by a range of mountains, an extension of the Ural system. The climate is cold and the vegetation very scanty. The island is permanently inhabited by a few Samoyeds, but in summer it is visited by a number of Russians for its fisheries and the fur-bearing animals.

VAIHINGER, vīʹhĭng-ẽr, Hans (1852–). A German philosophical critic, born at Nehren, and educated at Tübingen, Leipzig, and Berlin. He became docent at Strassburg in 1877, and professor in 1883, and in 1884 went to Halle as professor of philosophy and pedagogy. He is known chiefly as a critic of Kant. He edited *Kantstudien* after 1896, and wrote a *Kommentar zu Kants Kritik der reinen Vernunft* (2 vols., 1881–92); *Kant—ein Metaphysiker?* (1889); *Die transcendentale Deduktion der Kategorien* (1902). His other works include: *Goethe als Ideal universeller Bildung* (1875); *Hartmann, Dühring und Lange* (1876); *Nietzsche als Philosoph* (2d ed., 1902); *Die Philosophie in der Staatsprüfung* (1906); *Die Philosophie des Als Ob—System der theoretischen, praktischen, und religiösen Fiktionen der Menschheit* (1911; 2d ed., 1913).

VAIL. See Drinking Usages.

VAIL, văl, Alfred (1807–59). An American inventor, born at Morristown, N. J. He graduated at the University of the City of New York in 1836. In September, 1837, he entered into partnership with Prof. S. F. B. Morse (q.v.), agreeing to supply the funds necessary to bring

Morse's newly invented telegraph before the public, and to construct a practicable model at his father's ironworks at Speedwell, near Morristown, N. J. In January, 1838, the model was completed, and on the twenty-third was first publicly exhibited at the University of New York. When in 1843 work was begun on an experimental line between Washington and Baltimore, Vail became assistant superintendent. He suggested so many improvements to Morse's original apparatus, as did also Joseph Henry (q.v.), that the modern telegraph is considered by some to be the product of Vail and Henry rather than of its original inventor. Vail published *The American Electro-Magnetic Telegraph* (1845). Consult Pope, "The American Inventors of the Telegraph," in the *Century Magazine*, vol. xxxv (New York, 1888).

VAIL, Charles Henry (1866–). An American Universalist clergyman and writer on Socialism, born at Tully, N. Y. He graduated from the theological school of St. Lawrence University in 1893 and was pastor at Jersey City, and in New York State at Albany, Richfield Springs, and Albion (from 1906). Becoming deeply interested in the study of Socialism, he indorsed its principles and wrote: *Modern Socialism* (1897), *National Ownership of Railways* (1897), *Scientific Socialism* (1899), *The Industrial Evolution* (1899), *Mission of the Working Class* (1900), *The Socialist Movement* (1901), *The Trust Question* (1901), *Socialism and the Negro Problem* (1903), *Ancient Mysteries and Modern Masonry* (1909), *The World's Saviors* (1913), *Militant and Triumphant Socialism* (1913).

VAIL, Stephen Montfort (1818–80). An American Methodist Episcopal clergyman, born at Union Vale, Dutchess Co., N. Y. He graduated from Bowdoin College in 1838 and Union Theological Seminary in 1842, and was then a pastor in New York. For two years he served as president of Pennington Seminary (N. J.), and from 1849 to 1868 as professor of Hebrew in the General Biblical Institute at Concord, N. H. From 1869 to 1874 he was United States Consul to Bavaria. He strongly advocated the abolition of slavery and was an early champion of training for the ministry, writing effectively on both these subjects; also *Outline Lessons in Hebrew.*

VAIL, Theodore Newton (1845–). An American capitalist, born in Carroll Co., Ohio. He was educated at Morristown (N. J.) Academy, and then studied medicine for two years. He was early connected with the United States railway mail service, of which he was general superintendent in 1875–78. In 1878 he became interested in the telephone business, and after 1896 was identified with electric enterprises in the Argentine, introducing the American electric system of street railways in Buenos Aires, and installing telephone systems in the principal Argentine cities. Vail became president of the American Telephone and Telegraph Company and of the Western Union Telegraph Company. In 1913 the former corporation, which, because of its close relations with the Western Union and subsidiary companies, had become known as the "telephone trust," complied with the government's request for reorganization. Vail then resigned from his office in the Western Union. With other New Haven directors in 1916 he was acquitted of a charge of conspiracy to monopolize interstate commerce. In 1915 he received the honorary degree of LL.D. from both Princeton and Harvard.

VAILIMA (vī-lĕ'mȧ) **LETTERS.** A series of letters written from Samoa by Robert Louis Stevenson between November, 1890, and October, 1894. They are addressed to Sidney Colvin and contain a varied record of his Samoan exile. The title is derived from the name given by Stevenson to his island home.

VAILLANT, vȧ'yäN' (Marie) Edouard (1840–1915). A French socialist, born at Vierzon (Cher), and educated in Paris, where he studied engineering and then medicine, and in Heidelberg, Tübingen, and Vienna. After his return to Paris in 1870 he took a prominent part in the government of the Commune and served for a time as Minister of Education. He escaped to London on the downfall of the Commune, became a member of the general committee of the Internationale, took part in The Hague conference in 1872, and in the same year was sentenced to death *in contumaciam* by the Conseil de Guerre. After the amnesty of 1880 he returned to Paris, and in 1884 was elected to the municipal council, where he advocated the suppression of standing armies, national control of public services, and various socialistic measures. He opposed Boulangism very strongly, at the same time attacking the opportunism of the radical Republicans. He was elected several times to the Chamber of Deputies, where he sat as a Socialist.

VAIR. One of the tinctures in heraldry (q.v.).

VAISESHIKA, vī-sā'shē-kȧ. The name of one of the two great divisions of the *Nyāya* (q.v.) school of Hindu philosophy, and probably a later development of the Nyaya, properly so called. It agrees with the latter in its analytical method of treating the subjects of human research, but differs from it in the arrangement of topics and especially in its doctrine of atomic individualities or *viśēsas*—whence its name.

The topics or categories (*padārthas*) under which Kanāda (q.v.), the founder of this system, arranges his subject matter, are the following six: (1) substance, (2) quality, (3) action, (4) generality, (5) atomic individuality, and (6) coinherence; and later writers of his school add to these a seventh category, nonexistence. These may be explained more precisely. 1. Substance is the intimate cause of an aggregate effect; it is that in which qualities abide, and in which action takes place. It is ninefold—earth, water, light, air, ether, time, space, soul, and *manas*, or the organ of affection. 2. Quality is united with substance; it comprises, according to the commentator, the following 24 elements: color, savor, odor, feeling, number, dimension, individuality, conjunction, disconjunction, priority, posteriority, gravity, fluidity, viscidity, sound, understanding, pleasure, pain, desire, aversion, volition or effort, merit, demerit, and self-restitution. Seven of these are later additions to Kanāda's list. That qualities belong to the soul is maintained by the Vaiseshikas in opposition to the Vedantists and Sankhyas. 3. Action consists in motion, and abides in substance alone. 4. Generality abides in substance, quality, and action. It is of two kinds, higher and lower, or genus and species. 5. Atomic individuality resides in eternal substances, by which are meant *manas*, soul, time, space, ether, earth, water, light, and air; it is the *viśēsa* or ultimate difference; such differences are endless; and two atoms of the same substance, though homogeneous with each other, differ merely in so far as they exclude each other. 6. Coinherence, or perpetual intimate connection, resides in things which cannot exist independently from one another, such as the parts and the whole, action and agent, species and individual, atomic individuality and eternal substance. 7. Nonexistence, the last category, is defined by the modern Vaiseshikas as being either nonexistence without beginning, but with an end; or nonexistence, with a beginning, but no end; or absolute nonexistence, which has neither beginning nor end; or mutual nonexistence, which is the reciprocal negation of identity. The nature of each of these substances, qualities, and actions, is then the subject of special investigation. It is worthy of note that, according to the Vaiseshika system, understanding (*buddhi*) is the quality of soul, and the instruments of right notion are treated under this head. Kanāda admits of only two such instruments, or *pramāṇas*, perception and inference. Comparison, revelation, and the other instruments of right notion, mentioned in other systems, according to the commentators are included in these two. Fallacies and other modes of inconclusive reasoning are further dealt with in connection with inference, though with less detail than in the Nyaya, where these are favorite topics for discussion.

In point of time the Vaiseshika system antedates that of the Vedanta (q.v.) and possibly originated not long before the Christian era. The work of its reputed founder, Kanāda, has been commented upon by a triple set of commentaries, and popularized in several elementary treatises. J. T. Panchanana edited the text with the commentary of *Sankara Miśra* (Calcutta, 1861), while Ballantyne translated some of the sutras (Mirzapore, 1851).

VAISHNAVA, vīsh′nȧ-vȧ (Skt. *vāiṣṇava*, adherent of Vishnu). The general name of a worshiper of Vishnu (q.v.), but applied particularly to one who worships him in his incarnate form, either as Krishna or as Rāma. Even those who worship Vishnu under other forms, or avatars (see AVATAR), are adherents at the same time of one of these two sects. Of the two, the older division comprises the Krishnaites who were known in the earliest sectarian period (c.200 B.C.) as *Pāñcarātras* and *Bhāgavatas*. Whether these names were at first applied to the same sectaries or to two divisions of Krishnaites is not known; but in the seventh century A.D. they appear to be two distinct bodies. The essential tenet of these sects is that which is maintained by all Vaishnavas, viz., that, besides the identity of Krishna with Vishnu, the human soul is a distinct entity, while incorporate in an earthly body, and after the death of the body it becomes one with Vishnu. This qualified idealism distinguished the Vaishnavas philosophically from the Saivas (q.v.) on the one hand, and from the Vedantists (see VEDANTA) on the other. Another tenet held by all Vaishnavas, though not exclusively by them, is the doctrine of *bhakti* or saving faith, and this may be said to be the great popular support of these sects. It appears first in the *Bhagavadgītā* (q.v.), the oldest scripture of the Vaishnavas. According to this doctrine, all works and other beliefs are without essential value, though good works and right knowledge are useful. The one essential, however, is faith in Krishna (or Rāma) as Vishnu, i.e., as supreme deity. Salvation, further, consists in being received back into God's essence. The corresponding activity on the part of the divinity is grace or favor extended to such as have faith. In the grosser conception of Vishnu as a god occupying a heaven of his own, the soul, instead of being reabsorbed, simply shares the joy of this heaven.

At the present time the Krishnaites are largely in the majority in northern India, while the Ramaites are strongest in the southeast, the southwest being the home of one of the strong Krishnaite sects, which arose in the twelfth century. At this period, in fact, sprang up the chief sects of both parties, and from this time onward the antagonism between the sects and subsects of each separate division became powerful.

Before these popular schools or sects arose, a special division of Krishnaite Vaishnavas was formed (c.1200 A.D.) on the Malabar coast under the influence of Anandatirtha, the founder of a school known as Madhvas. He taught not only the separate existence of human souls, but the separate existence of matter as an eternal essence. This school remains a restricted southern growth, but the duality doctrine, as it is called, has been accepted by the masses over a wide area. Both the next great Krishnaite sects emphasize an entirely new practice, on which they lay more weight than they do on theology or metaphysics. This is the practice of revering the Child Krishna. No trace of this cult, with its accompaniment of madonna worship, is to be found in the records of the older sects, and it is possible that the practice was an imitation of Christian usage. Unfortunately, with the introduction of this child worship was still retained the antique conception of Krishna as an amorous shepherd, and under the influence of these two images, together with the continual emphasis upon *bhakti*, the worship of Krishna-Vishnu rapidly deteriorated. This element became supreme in the later development of the Krishnaite sects of the north, where among the lower classes it has superseded all other religious notions and has deeply affected even the cultivated classes.

The first of these sects is that of Caitanya, who was born in Bengal in 1485. His special religious tenet was love for Krishna. This was expressed by songs and dances of a licentious character. Caitanya himself, like most of the late Vaishnava teachers, was regarded as also divine and as a reincarnation of Krishna himself. The second great sect of Krishnaites arose in the northwest and was founded by Vallabha, called also Vallabhacarya. His sect was no less self-indulgent. The worship of the Child Krishna was particularly affected by the Vallabhas with all its excesses. But the sect is saved from the uniform low level of the Caitanyas through the fact that it is not without sectarian literature. The founder reverted to the nondualistic doctrine of the Vedanta, and the philosophy of his school is thus distinguished from that of Caitanya, who taught that each believer was to exist as a separate spirit in a heaven filled with sensual pleasures. Both these sects elevate Radha, the mistress of Krishna, to a divine position. A reform of both these religious bodies took place in the eighteenth century. The Caran Dasis were protestants against the excesses of the Vallabha sect and they instituted a moral reform based on the purer belief and practice of the southern Madhva Krishnaites. A similar protest against the Vallabha sect resulted in the formation of a new division under the leadership of Narayana, who was worshiped as a god by his adherents. Other reforming sects of this sort scarcely deserve to be called Vaishnavas, as they are eclectic deists.

At the same time that Madhva was founding his Krishnaite sect in southwestern India, Ramanuja in the southeast (about Madras) was founding the first distinctively Ramaite Vaishnava sect. The Ramanuja sect remained in the south, but the sect founded by Ramanuja's follower, Ramanand, was operative in the north in the fourteenth century, and to this sect are due in succession some of the reform movements of more recent times. The Northern School (Vadagalis) hold to the monkey doctrine, while the Southern School (Tengalais) affect the cat doctrine. The former doctrine holds that God saves the sinner as a monkey does its young, by allowing the young to embrace it and be carried to safety. The cat doctrine is Calvinistic, affirming that God saves as does a cat, by picking up the kitten without concurrence or effort on the kitten's part. The Tengalais are the more numerous and have a theological literature written in Tamil (see TAMILS).

But the great difference between Krishnaites and Ramaites is moral and intellectual. The Krishnaite Vaishnavas, with few exceptions, such as that of the high-caste Madhva sect, are as epicurean and licentious in practice as they are unphilosophical in intellect. What literature they possess is small, apart from erotic poetry. On the other hand, the Rama schools have elaborated complete theological systems, and, generally speaking, they are morally above reproach. Most Ramaites hold that the deity is not without qualities, and in logical conclusion they maintain that Rama as Vishnu has a heaven of pure delight in which the believer will lead a pure but joyful existence, not being absorbed into the divine essence. In consequence of the moral tone of the Rama Vaishnavas, it is from them rather than from the Krishnaites that the later reformers draw their inspiration. Kabir, one of the disciples of Ramanand, founded the sect of the Kabir Panthis, which still has a large following in northern India, but unites Rama and the divine monkey, Hanuman (q.v.), in one common worship. A purely deistic sect also claiming Ramanand as the teacher of their founder is that of the Dadu Panthis. The literature of the modern Vaishnava sects is best represented by the *Ramcaritmanas* of Tulasidasa, the greatest of modern Hindu poets, and by the *Premsāgar* or ocean of love, an erotic-religious poem of the Vallabha sect. For the older literature, see the article VISHNU.

It remains only to be said of the Vaishnavas that some of the subsects worship almost exclusively the female side of Vishnu, in the form of his wife, Lakshmi (q.v.), or in that of Sita, the wife of Rama. The Vaishnavas have several famous festivals, the chief being that of the *Rath Yāha* in Bengal, in which an image of the god is carried in a procession, the *Janmaṣṭamī* or birthday festival of the Child Krishna at Benares, and the *Rās Yāha* or dance festival, commemorating the dancing of Krishna with the Gopis, his mistresses. The general sign of all Vaishnavas consists of two perpendicular marks on the forehead. They revere as symbols the Tulasi plant and the salagrama stone, a white pebble; the veneration for this latter as a symbol, however, is of recent origin. See HINDUISM.

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VAL, FRANÇOIS DU. See FONTENAY-MAREUIL.

VALAAM, vá-läm′ (Finnish *Valamo*). A small, wooded island (12 square miles in area) in the northern part of Lake Ladoga (q.v.) in Finland, Russia (Map: Russia, D 2). It is very picturesque and surrounded by 40 smaller islands. On its south end is the famous Valaam Monastery of the Transfiguration which attracts numerous pilgrims.

VALAIS, vá′lā′ (Ger. *Wallis*). A canton of south Switzerland (Map: Switzerland, B 2). Area, 2027 square miles. It consists of the valley of the Rhone and a number of lateral valleys along its tributaries, inclosed by the Bernese Alps on the north and the Valais Alps on the south. Valais abounds in glaciers which occupy about one-fifth of its area. The highest point is the Dufour Peak on Monte Rosa, 15,217 feet. Valais contains many kinds of minerals, principally lead, gold, iron, anthracite, marble, and limestone. Most of these minerals are worked. The canton is chiefly pastoral, vineyards and orchards being found only in the deep valleys. The wines of Valais are well known. The chief manufactures of the canton are soap, glass, sugar, and dynamite. The constitution of Valais provides for a legislative assembly (*Grand Conseil*) elected directly at the rate of one member for every 1000 inhabitants. The capital is Sion (q.v.). Pop., 1910, 129,579; almost entirely Roman Catholic. The French-speaking inhabitants, who form about two-thirds of the population, inhabit the western part of the canton and the German-speaking the eastern.

The valley of the upper Rhone, the *Vallis Pœnina* of the Romans, was conquered by the Romans in 57 B.C., and later incorporated with Rhætia. On the dissolution of the Roman Empire the region was occupied by the Burgundians, whose rule was supplanted by that of the Franks. After the disruption of the Frankish realm, at the close of the ninth century, it formed part of the Kingdom of Transjurane Burgundy and then of the Kingdom of Arles. Later the bishops of Sion and the counts of Savoy held sway in western or Lower Valais, contending with each other for dominion, while Upper Valais was colonized by Germans, who founded a number of independent communities or tithings. Finally, in the fifteenth century, Upper Valais, after joining the Swiss Confederation, secured control of Lower Valais, which was ruled as a subject territory. In 1798 the whole region became part of the Helvetic Republic. In 1802 Valais was made an independent republic by Napoleon, who annexed it in 1810 to France as the Department of Simplon. It was freed in 1814, and in 1815 was constituted a canton of the Swiss Confederation. It took part in the League of Sarnen as well as in the Sonderbund.

VALCKENAER, väl′ke-när, Lodewijk Kaspar (1715–85). An eminent Dutch classical scholar, born at Leeuwarden, and educated at Franeker and Leyden. In 1741 he became professor of Greek at Franeker, and 25 years later was called to Leyden. He is known for his editions of Eurĭpides' *Phœnissæ* (4th ed., 2 vols., 1824) and the *Hippolytus* of Euripides, which contained the famous *Diatribe in Euripidis Perditarum Fabularum Fragmenta* (1768). He also edited Homer's *Iliad* with Scholia (1747), Theocritus, Bion, and Moschus (1781). His greatest work, however, was his *Diatribe de Aristobulo*, first published posthumously by Luzac (1806), in which he exposed the literary forgeries of the Alexandrians. His *Opuscula Critica, etc.*, were published in 2 vols. (1801). Consult: L. Müller, *Geschichte der klassischen Philologie in den Niederlanden* (Leipzig, 1869); Bergmann, *Memoria Valckenarii* (Utrecht, 1874); J. E. Sandys, *A History of Classical Scholarship*, vol. ii (Cambridge, 1908).

VALDAI (vål-dī′) **HILLS**. A low plateau or group of hills in west central Russia, occupying the southwestern parts of the governments of Novgorod and Tver, midway between St. Petersburg and Moscow (Map: Russia, D 3). They form the culminating portion of the broad elevation running through central Russia, and rise very gradually from the surrounding plain. They are dissected by numerous narrow valleys containing a number of lakes. The hills rise to the maximum height of 1150 feet above the sea. They were formerly forested, but are now mostly cleared and cultivated. In the plateau rise the Volga and its branches which flow east and south to the Caspian, the Dnieper and the Don to the Black Sea, and others northwest to the Baltic.

VALDEGAMAS, vål′då-gä′mås, Marqués de. See Donoso-Cortés.

VAL-DE-GRÂCE, vål′-de-gräs′. A former Benedictine nunnery in Paris, founded by Anne of Austria, and changed into a military prison in 1790. The dome of the church, dating from 1645, is modeled on that of St. Peter's at Rome. The church was the place of burial of the French royal family and the Orleans princes, and contains the tomb of Henrietta, wife of Charles I of England.

VAL-DE-GRACE, Jean Baptiste du. See Cloots, Baron.

VAL DEL BOVE, väl dĕl bō′vå. A crater of the volcano of Etna (q.v.).

VALDEPEÑAS, väl′då-pån′yås. A town of the Province of Ciudad Real, Spain, 115 miles south of Madrid, on the right bank of the Jabalón River (Map: Spain, D 3). It is on the highway to Andalucía. It has manufactures of spirits, flour, and cooperage ware; but its reputation rests mainly upon its celebrated red wine. There are chalybeate springs in the vicinity. Municipal pop., 1900, 20,688; 1910, 23,580. The town made an heroic defense against the French in 1808.

VALDER, José Lucio. See Bomfim, Count.

VALDÉS, vål-dās′, Armando Palacio. See Palacio Valdés.

VALDÉS, Juan de (c.1500–41). A Spanish-Italian theologian and reformer. He was born at Cuenca, in Castile, imbibed some of the ideas of the Reformation in Germany, and in 1528 wrote a treatise, *Diálogo de Mercurio y Carón*, criticizing the Church in such manner that the Inquisition made Spain uncomfortable for him. He went to Naples in 1530, spent some time in Rome and Bologna, and in 1533 returned to Naples, where he resided until his death. He devoted himself to study and literature and gathered round him a choice circle, including Peter Martyr and Vittoria Colonna. He was an advocate of the Lutheran doctrine of justification by faith, but remained a Catholic. His *Diálogo de la lengua* (Naples, 1533) is the earliest philological treatise we have in Spain. His works earn him high rank among Spanish writers.

Consult: B. B. Wiffen, *Life and Writings of Juan de Valdés, with a translation from the Italian of his Hundred and Ten Considerations*, by John T. Betts (London, 1865); Edward Boehmer, *Spanish Reformers of Two Centuries* (1874); id., *Lives of Juan and Alphonso de Valdés* (1882); Marcelino Menéndez y Pelayo, *Los Heterodoxos Españoles* (Madrid, 1880) and in his *Obras completas*, vol. i ss. (Madrid, 1911, etc.).

VALDÉS, Juan Meléndez. See Meléndez Valdés, Juan.

VAL′DEZ. An incorporated city on a northern arm of Prince William Sound, Alaska, the most northerly port that is open throughout the winter (Map: Alaska, K 5). The great interior Alaskan mail route lies over the wagon road from Valdez to Fairbanks, where passengers and mail are carried by stage in summer and on sleds in winter. The junction of the cables and land lines is made at Valdez, of the United States Signal Corps telegraph system of over 4000 miles. The city has churches, schools, and a telephone system. Pop. (1915), about 1200.

VALDEZ, Pierre. See Waldenses.

VAL D' ISPICA. See Ispica, Val d'.

VALDIVIA, vål-dē′vē-å. A province of South Chile, bounded by Llanquihue on the south, Cautín on the north, Argentina on the east, and the Pacific on the west (Map: Chile, E 5). Area, 8352 square miles. The larger part of the surface is level and only the portion adjoining the Andes and the coast land are mountainous. The climate is moist and healthful and the soil is fertile. Forests are abundant in the mountainous regions, and timber is one of the most important products of the province. The chief occupations are lumbering, agriculture, and grazing. Pop., 1903, 78,073; 1912, 141,298, including a large German element. Capital, Valdivia.

VALDIVIA, Pedro de (c.1497–1554). The Spanish conqueror of Chile. He was born at Serena, in Estremadura, and served in the Spanish armies in the Italian wars, being present at the capture of Milan and the battle of Pavia (1525). He went to the New World and in Mexico joined Cortés, by whom he was sent to

Peru when Pizarro asked for help against the Inca insurrection in 1535. His brilliant conduct in the battle of Salinas led to his selection to prosecute the conquest of Chile. In March, 1540, he started south with 150 men. Early in 1541 he laid the foundations of the city of Santiago, and for six years he successfully combined the establishment of settlements in the country with the operations against the Indian armies. In December, 1547, he returned to Peru, where he rendered important service on the royal side in the contest with Gonzalo Pizarro. As soon as this rebellion was ended on the plain of Sacsahuana, Valdivia hastened back to Chile, in January, 1549, to renew the war against the Araucanian Indians. He met with repeated successes, but was unable to stamp out the guerrilla bands, which united in a fierce attack on the Spanish fort at Tucapel in December, 1553. Valdivia hastened to its relief, and had all but dispersed the Araucanians, when the latter were suddenly rallied by a young native page of Valdivia, named Lautaro, who deserted his master at the critical moment, called upon his countrymen to renew their attack, and annihilated the Spaniards (Jan. 1, 1554). Valdivia was captured and killed, despite the efforts of Lautaro to save his life. Consult *Colección de documentos inéditos para la historia de Chile . . . publicados por J. T. Medina: Valdivia y sus compañeros* (6 vols., Santiago de Chile, 1896–97).

VALDOS'TA. A city and the county seat of Lowndes Co., Ga., 156 miles southwest of Savannah, on the Atlantic Coast Line, the Georgia and Florida, the Valdosta, Moultrie, and Western, and the Georgia Southern and Florida railroads (Map: Georgia, C 5). It is the shipping centre of a region engaged in cotton and fruit growing and farming, and manufactures cloth, lumber products, fertilizers, buggies, cottonseed oil, foundry and machine-shop products, and naval stores. Noteworthy features are the South Georgia Normal College, the high schools, the Federal building, and the Carnegie library. Valdosta was settled in 1859, and was incorporated in 1860. Pop., 1900, 5613; 1910, 7656.

VA'LENCE. See VALENCY.

VALENCE, vá'läɴs'. The capital of the Department of Drôme, France, 66 miles by rail south of Lyons, crowning a hill on the left bank of the Rhone, below the confluence of the Isère (Map: France, S., K 4). The cathedral of St. Appolinaire, in the odd Auvergnat-Romanesque style, consecrated in 1095, contains an apse with colonnade. The Maison des Têtes (sixteenth century), with its beautifully decorated windows and its front sculptured with heads of Homer, Aristotle, Pythagoras, and Hippocrates, and the fine paintings of the church of St. Jean Baptiste are worthy of mention. There is a fine suspension bridge over the Rhone. Across the river lie the interesting ruins of the Crussol, a twelfth-century castle. The printing of linen and cotton fabrics, the manufacture of flour and tinned foods, and agriculture are important industries. The vineyards are of great extent. Pop., 1901, 26,946; 1911, 28,706. Valence is the Valencia of the Romans.

VALEN'CIA, *Span. pron.* vȧ-lân'thê-á. The name of a former kingdom of Spain, comprising the present provinces of Valencia, Alicante, and Castellón de la Plana. The region is bounded on the north by Aragon and Cataluña, on the east by the Mediterranean, on the south by Murcia, and on the west by Murcia, New Castile, and Aragon. Area, 8830 square miles. The surface is of a broken mountainous character, with some small plains scattered along the coast and in the uplands of the southwest. The plains bordering the Mediterranean abound in lagoons, from many of which salt is derived in large quantities. There are few good harbors. The most important rivers are the Segura, Guadalaviar (or Turia), Júcar, and Mijares. The rainfall varies greatly, and the cold north winds and the hot southwest winds are very dry. The temperature varies from the extreme summer heat of the lower coast plains and valleys to the extreme winter cold of the inland mountain regions. With this variation in temperature and rainfall there is a wide variety of agricultural products. Wheat and other cereals are grown in fairly large quantities, but their yield is surpassed by that of the vine, rice, sugar, and fruits, among which the exports of oranges and figs have the lead. The stock-raising interests of the section, chiefly sheep and goats, are important. The mining industry is not very large, lignite, iron, lead, and zinc being produced in small quantities. In manufactures Valencia ranks next to Cataluña and has extensive textile establishments, iron and copper foundries, distilleries, sugar mills, and potteries. The fisheries and the curing of salt fish also employ a considerable portion of the population. The inhabitants, who preserve many traits of the Moorish admixture, in 1900 numbered 1,587,533, and in 1913, 1,727,759. Upon the dissolution of the Caliphate of Córdoba in the early part of the eleventh century, Valencia became an independent kingdom. Towards the close of the century it passed under the rule of the Almoravides, who were supplanted three years later (1095) by the Cid, whose death (1099) soon forced his widow again to give way to the Moors. In 1238 the city of Valencia was taken by James I of Aragon, who soon became master of the region.

VALENCIA. A Mediterranean seaport of Spain, capital of the Province of Valencia, 185 miles east-southeast of Madrid, on the right bank of the Guadalaviar, 2½ miles from its mouth (Map: Spain, E 3). As the capital of the former Kingdom of Valencia it retains many traces of Moorish occupancy. The surrounding huerta resembles a vast shady orchard and bears magnificent groves of citron, orange, and mulberry. The city itself is picturesque in the crowded, narrow, and winding streets of the older portion and charming in the broader streets and luxuriant plazas and paseos of the newer part. Its climate is mild and very dry. The public buildings are numerous and interesting architecturally and because of their historical significance. Among the important churches the Cathedral La Seo, with its splendid octagonal tower El Miguelete, occupies first place. This structure was begun in 1262 and completed in 1482. Before the Puerta de los Apóstoles of the cathedral there meets every Thursday the Tribunal de las Aguas, which is the oldest tribunal in Spain and controls the distribution of the irrigation water. The church of San Andrés contains some beautiful frescoes and paintings of Juanes, Ribalta, and Vergara. The former Convento del Cármen is now utilized for the Provincial Museum of Paintings, with a very complete collection representing the Valencian school and some notable foreign works. La

Lonja (the silk exchange), the centre of the commercial life of the city, is a beautiful Gothic structure, built on the site of the Moorish Alcázar. The Aduana, a superb structure erected for a customhouse by Charles IV, is now occupied as a tobacco factory, employing 4000 operatives. The provincial hospital, housed in a fifteenth-century structure, accommodates 6000 patients annually. The ornamental Plaza de Toros, or bull ring, reputed the best in Spain, seats 17,000 spectators. The Plaza del Mercado is the largest of the public squares of the city; others of note are the Plaza del Príncipe Alfonso, the Plaza de Tetuán, the site of the old citadel, and the Plaza de la Reina, a busy shopping and café centre. The harbor of Valencia (El Grao) is one of the most secure on the Mediterranean coast. The chief exports are rice, melons, oranges, and other fruits, green and dried, wines, silks, raw and spun, and an excellent quality of olive oil. The industries of the city include tobacco manufacturing, silk spinning, and hemp and linen weaving. There are also manufactures of velvet, hat plush, felt, gloves, fans (a special product), iron and bronze ware, leather goods, and especially the glazed pottery ware and the glazed bricks known as azulejos, for which there are more than 20 establishments in the environs of the city. The agricultural industries of the vicinity are also important. Valencia is the seat of one of the foremost universities of Spain. (See Valencia, University of.) The population, illustrating in character and physical traits the early Moorish admixture, numbered, in 1900, 213,550; in 1910, 233,348. Valencia first appears in history in 138 B.C., when it was given the *Jus Latinum*. It was destroyed by Pompey, captured by the Visigoths in 413, and by the Moors in 714. In 1021 it became the capital of an independent Moorish kingdom. In 1095 it was captured by the Cid, but the Moors subsequently assumed control, until its final capture by James I of Aragon in 1238. The expulsion of the Moriscoes at the beginning of the seventeenth century greatly crippled its prosperity, and by espousing the Austrian side during the War of Spanish Succession it lost many of its ancient privileges. In 1812 it was captured by Suchet and remained in the possession of the French until the following year.

VALENCIA. See Valentia.

VALENCIA. The capital of the State of Carabobo, Venezuela, situated 24 miles south of Puerto Cabello, with which it has railway connection, near the western end of Lake Valencia or Tacarigua (Map: Venezuela, D 1). Valencia is well constructed with broad streets, well-kept plazas, a beautiful market and alameda. It contains a notable cathedral erected during the first half of the nineteenth century. The city is on the banks of the Aragua River. The chief exports are coffee, sugar, cacao, and hides. Pop. (est.), 27,538. Valencia was founded in 1555. During the struggle for independence it was the scene of battles fought by Bolívar in 1814 and 1821, the latter of which gained the freedom of Venezuela from Spain. On account of the various sieges from 1810 to 1821 and the great earthquake of 1812, there are many ruins in the vicinity.

VALENCIA, Duke of. See Narváez, R. M.

VALENCIA, University of. A Spanish university, founded by the union (1411) of an episcopal foundation for theology (1345) and a municipal school of arts, medicine, and civil and canon law (established shortly after). A papal bull confirmed the union about 1500. Several colleges were founded in the sixteenth century, the period of the greatest prosperity of the institution. From that century it sank in numbers and reputation. It was reorganized in the decade 1848–58, and has since grown to be one of the leading universities in the Kingdom, with faculties of philosophy, law, natural science, and medicine, and in 1913 some 1700 students.

VALENCIENNES, vȧ'läɴ'syĕn'. The capital of an arrondissement in the Department of Nord, France, and a fortress of the second class, at the junction of the Rhondelle and the Scheldt, 30 miles by rail southeast of Lille (Map: France, N., J 2). Broad boulevards are laid out on the site of the old fortifications, which were demolished in 1892. There are many houses of the seventeenth century, which give the streets a mediæval appearance. The handsome Hôtel de Ville, pure seventeenth century except the façade, contains a large collection of paintings, especially of the Flemish school (including splendid specimens of Rubens), and a collection of sculptures. The Gothic church of Saint-Géry, dating from the thirteenth century, with a modern tower, and the church of Notre Dame du Saint-Cordon, a modern structure in thirteenth-century style, with beautiful stained-glass windows by Lévêque, are worthy of notice. In the old Jesuit College is the municipal library of more than 25,000 volumes, containing much valuable Romance literature. There are an academy for sculpture and painting, a museum of natural history, an immense hospital, a lycée, and an arsenal. The famous Valenciennes lace is no longer manufactured. The extensive coal fields amid which Valenciennes lies have made it a metallurgical centre. Glass, sugar (from beets), chemicals, cambrics, and lawns are also manufactured. Chicory coffee is shipped in large quantities. Pop., 1911, 34,766. Valenciennes is the Roman Valentiana. It came to France by the Treaty of Nimeguen in 1678. It was taken by the Germans in August, 1914. See War in Europe.

VALENCIENNES. See Lace.

VALENCIENNES, Achille (1794–1865). A French zoölogist, born in Paris and educated there. In 1836 he became professor of ichthyology at the Museum of Natural History. He collaborated with Cuvier in preparing *Histoire naturelle des poissons* (11 vols., 1829–49), the last five volumes being written solely by Valenciennes. Valenciennes wrote *Histoire naturelle des mollusques, des annélides et des zoophytes* (1833).

VA'LENCY (Lat. *valentia*, strength, from *valere*, to be strong, able; connected with OIr. *flaith*, power, Lith. *galeti*, to be able, Goth. *waldan*, OHG. *waltan*, Ger. *walten*, AS. *wealdan*, Eng. *wield*), Valence, or Atomicity. In chemistry, the combining capacity of an atom, with reference to the number of other atoms with which it can be directly combined. The conception of valency is an offspring of the atomic and molecular theories. These theories led to a knowledge of the numbers of different atoms making up the molecules of compounds; but as in many cases very different compounds were found to have the same composition and the same molecular weight, it became clear that differences in the chemical and physical properties of compounds must often be caused by differences in the manner of combination of their atoms. Those differences of combination had to be investigated, and thus arose the question, In what manner does affinity act in holding together the atoms of compounds? In considering various compounds with a view to obtaining some light on this question, chemists were gradually led to a series of assumptions, the incorporation of which in atomic chemistry has proved exceedingly fruitful.

First of all it was observed that, in compounds of hydrogen with some one other element, one atom of hydrogen can hold in combination only one atom of the other element; this was shown by such compounds as hydrochloric acid (HCl), hydrobromic acid (HBr), hydriodic acid (HI), etc., and the fact was expressed by saying that hydrogen is univalent or monad. The valencies of certain other elements were then found by considering their compounds with hydrogen, on the principle that by every unit of their combining capacities the atoms of those elements can hold one atom of hydrogen; for hydrogen itself is univalent, i.e., has unit-combining capacity. From the compounds already mentioned it may be seen that the atoms of chlorine, bromine, and iodine are, like hydrogen, univalent; for each atom of these elements can be combined with only one atom of hydrogen. Similarly, compounds like water (OH_2), sulphureted hydrogen (SH_2), ammonia (NH_3), and marsh gas (CH_4) show that oxygen and sulphur are divalent, that nitrogen is trivalent, and that carbon is quadrivalent. The valencies peculiar to some of the elements being thus established by an inspection of their compounds with hydrogen, the valencies of the other elements can be found by studying their compounds not necessarily with hydrogen, but with any element of known valency. Thus compounds like sodium chloride (NaCl), potassium chloride (KCl), etc., show that the atoms of sodium and potassium are univalent; for they can hold in combination only one atom of another univalent element. The same thing is shown by the fact that sodium or potassium takes the place of one atom of hydrogen in acids, e.g., in hydrochloric acid:

$$\mathrm{Na} + \mathrm{HCl} = \mathrm{NaCl} + \mathrm{H}$$
$$\mathrm{K} + \mathrm{HCl} = \mathrm{KCl} + \mathrm{H}$$

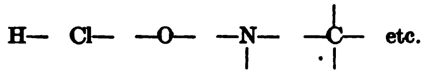
Evidently, an atom of sodium or potassium is equivalent to an atom of hydrogen, and as the latter is univalent, the former, too, must be univalent. Similarly, an atom of calcium takes the place of two atoms of hydrogen:

$$\mathrm{Ca} + \frac{\mathrm{HCl}}{\mathrm{HCl}} = \mathrm{CaCl_2} + 2\mathrm{H}$$

and therefore the element calcium, or rather an atom of this element, is considered divalent.

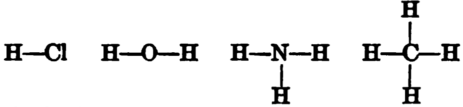
Thus a few simple compounds and a few simple reactions led to a knowledge of the valencies peculiar to all of the elements. The conception of valency has proved especially useful in the domain of organic chemistry, i.e., the chemistry of the compounds of carbon. Our modern structural theory is based entirely on the assumption that an atom of carbon is invariably quadrivalent; and the usefulness of the structural theory can hardly be overestimated. For it exhibits in a clear and simple manner the relations between similar as well as different compounds, and, above all, it permits of determining the exact number of different compounds that may have the same composition and the same molecular weight, and thus permits of foretelling the existence of compounds before they have been actually obtained.

Graphically each unit of combining capacity of an atom is represented by a dash added to its symbol. The valencies of different elements are thus denoted as follows:



$$\mathrm{H{-}} \qquad \mathrm{Cl{-}} \qquad \mathrm{{-}O{-}} \qquad \underset{|}{\mathrm{{-}N{-}}} \qquad \overset{|}{\underset{|}{\mathrm{{-}C{-}}}} \qquad \text{etc.}$$

When two atoms combine, at least one valency of each is employed, and in compounds like the following, the atoms are said to be linked together by single bonds, each bond evidently representing two valencies or affinities (i.e., one unit-combining capacity of each of the combining atoms):



$$\mathrm{H{-}Cl} \qquad \mathrm{H{-}O{-}H} \qquad \underset{\underset{\displaystyle\mathrm{H}}{|}}{\mathrm{H{-}N{-}H}} \qquad \overset{\overset{\displaystyle\mathrm{H}}{|}}{\underset{\underset{\displaystyle\mathrm{H}}{|}}{\mathrm{H{-}C{-}H}}}$$

Hydrochloric acid Water Ammonia Marsh gas

The graphic representation of valency suggests an important question, viz.: Are the valencies of an atom forces acting only in certain directions, or do they act, like gravity, in all directions? A further question naturally suggests itself in the case of atoms having more than unit valency, viz.: Are the several affinities equal to one another in power? To answer these questions is a matter not of idle speculation, but of necessity in the case—again—of the compounds of carbon. The study of these compounds has led chemists to make the following assumptions: (1) the four valencies of carbon are in all respects equal; (2) they act in four different directions, which are perfectly symmetrical with respect to the carbon atom. The carbon atom is, viz., imagined to be placed at the centre of a regular tetrahedron, and four equal forces are assumed to act in the directions of the four vertices of the tetrahedron. A further assumption that thrusts itself upon the organic chemist is that in every compound capable of independent existence all the valencies of the constituent atoms are satisfied by combination, and that no valency is free. Without these working assumptions organic chemistry can make no progress. These assumptions made, there is hardly a general fact that remains unaccounted for. The assumptions, though hypothetical in character, are therefore incorporated as principles of science, and thus in connection with the compounds of carbon chemistry answers in a sense the question stated at the beginning of this article, viz.: In what manner does affinity act in holding together the atoms of compounds?

In the case of other elements than carbon, the application of the idea of valency has been much less useful and much less successful. In fact, the obstacles in the way of consistently applying the idea to the several elements are so great that the idea would probably have been abandoned long ago, were it not for its great usefulness in the case of carbon. The chief obstacles are as follows: First, the valencies of most elements are found to be variable and hence unreliable as a basis for predicting the constitution of unknown substances. Thus, while in ammonia (NH_3) the atom of nitrogen is trivalent (because combined with three univalent atoms of hydrogen), in nitric oxide (NO) it is divalent (because combined with one divalent atom of oxygen), and in ammonium chloride (NH_4Cl) it is pentavalent (because combined with five univalent atoms, viz., four hydrogens and one chlorine). In other compounds nitrogen seems to have still other valencies. Turning to iron, we find it divalent in ferrous chloride ($FeCl_2$) and trivalent in ferric chloride ($FeCl_3$). Chlorine is univalent when combined with hydrogen, and quinquivalent when combined with oxygen. Sulphur is divalent when combined with hydrogen, and hexavalent when combined with oxygen. Phosphorus is trivalent when combined with hydrogen, and quinquivalent when combined with oxygen. Oxygen is divalent in nearly all of its compounds; yet in dimethyl ether hydrochloride oxygen must be assumed to be quadrivalent. Further, it has been stated above that the atoms of hydrogen, chlorine, iodine, and sodium were primarily assumed to be univalent. One might therefore expect that in all combinations of any two or three elements one atom of one would combine with one, and only one atom of the other. Yet the compound called trichloride of iodine has the formula ICl_3. Is iodine trivalent in this compound? Another compound, a hydride of sodium, appears to have the formula HNa_2. Is hydrogen in this compound divalent? And is, therefore, the valency even of hydrogen variable? Again, when we find the molecule of hydrogen gas to be made up of two hydrogen atoms, we conclude that the affinity of each of these atoms is satisfied by that of the other atom. But the molecules of certain univalent elements (the vapors of sodium, potassium, iodine, at high temperatures, etc.) are known to be made up each of a single atom. Are the affinities of these single atoms free? Or shall we accept the verdict of organic chemistry, according to which the molecule of a substance capable of independent existence can contain no free affinities? But then how can a single atom form a molecule?

While we thus search in vain for an explanation as to what becomes of affinities in certain compounds, we find that other compounds seem to involve the use of more valencies than those possessed by the constituent atoms. Examples of such compounds are presented by the innumerable known crystallohydrates, like $NaCl.2H_2O$, made up of several molecules within each of which all the available valencies should be expected to be satisfied. Other examples of this kind are presented by many of the minerals found in nature. Do atoms, then, possess additional valencies which sometimes do and sometimes do not come into play?

If, with all these unanswered questions in mind, we return to a consideration of the compounds of carbon—compounds for which the valency doctrine has rendered its best services—we find that really here also the assumption of the constancy of valence, viz., of the constant quadrivalence of the carbon atom, is by no means generally correct. In the first place we have the classic case of carbon monoxide: in this compound (CO) the carbon atom appears to be divalent; the only escape from this conclusion is by way of assuming that the oxygen atom is quadrivalent, which is but little more satisfactory than ascribing an exceptional valency to the carbon. In another compound, fulminic acid (HCNO), the carbon atom is quite certainly divalent. But the most striking examples of carbon acting with a valency other than four are presented by triphenyl-methyl (first prepared by Gomberg) and a series of analogous substances discovered in recent years. Triphenyl-methyl is methyl, CH_3, in which the three hydrogen atoms have been replaced by phenyl (C_6H_5) groups. But triphenyl-methyl is not a radicle; it is a compound leading an independent existence; therefore, the carbon atom to which its three phenyl groups are linked is indubitably trivalent—as much so as it would be in methyl itself, if methyl could be isolated as an independent compound.

In view of such facts, and notwithstanding the great services rendered by the old working assumption of the constant quadrivalence of carbon, there remains to-day no justification for thinking of valency as an immutable property of the atom; the combining capacity of an atom, of which its valency is a measure, must be recognized as capable of being diminished or increased under the influence of the other atoms, or groups of atoms, with which the given atom is linked. And recognizing this, we may well expect the birth of new classes of compounds, unknown to the older organic chemistry, and so the creation of a theory of such compounds becomes a matter of possibly the greatest practical importance.

This explains why in recent years so much speculation is being published concerning the ultimate nature of valency. A sound theory of valency, which such speculation may sooner or later introduce, will not only, as our purely formal valency doctrine has done, guide the chemist to the preparation of new compounds; it will answer the many questions which chemistry is now compelled to ignore, and it will give us the much-needed and long-sought insight into the constitutional peculiarities of benzol and its innumerable, and in many cases, immensely valuable derivatives. Consult J. A. N. Friend, *The Theory of Valency* (New York, 1909). See CARBON COMPOUNDS; CHEMISTRY; STEREOCHEMISTRY.

VA'LENS (c.328–378 A.D.). Roman Emperor of the East (364–378 A.D.). He was the brother of Valentinian I (q.v.), and was born near Cibalis, in Pannonia. He was associated with his brother in the Imperial authority, receiving as his share of the Roman world Asia, Egypt, and Thrace, in 364. His sovereignty was, however, disputed by Procopius, a supposed scion of the race of Constantine, who raised his standard in Thrace, was crowned at Constantinople, and for two years maintained his ground with skill and courage, till the defeat of his troops at Thyatira and Nacolea, followed by his capture and death in 366. The first prominent act of Valens's reign was a reduction of 25 per cent in the taxes. The prolonged imprisonment of 3000 Ostrogoths, who had been sent to aid Procopius, led to a war which lasted from 367 to 369. The contest was carried on in the country of the Goths and was throughout in favor of the Romans. Difficulties arose immediately afterward (370) with the Persians, who sought to occupy Armenia, although war was not declared till the end of 372, when the Romans were victorious. Valens, who had removed to Antioch at the beginning of the war, now occupied himself with the religious quarrels between the Arians and the orthodox party, which at that time raged with much violence over the whole Eastern Empire. Affairs on the eastern frontier again assumed a threatening aspect; but the Romans were disinclined any longer to interfere with the designs of the Persians on Armenia, and concluded a somewhat discreditable treaty in 376. Meanwhile the Goths, who had for some time been peacefully settled in Dacia, were assailed by the advancing hordes of the Huns. The Ostrogoths, who first felt the shock, were partly incorporated, and the remainder forced to retreat; the Visigoths next attempted to stem the torrent, but without success, and crowds of fugitives gathered at the north bank of the Danube. Valens accorded permission to a large body of Goths under Fritigern to cross into Mœsia and Thrace, and take possession of the waste lands in these provinces; the fugitive Ostrogoths soon afterward crossed the river without permission; and the alarm which the numbers and turbulence of his new subjects speedily aroused led Valens to the adoption of such impolitic measures that the gratitude of the Goths for shelter afforded was turned to bitter resentment. Valens at last resolved on war, and engaged the Goths near Adrianople, Aug. 9, 378. His army was totally routed, and two-thirds of it, including Valens himself and most of his chief officers, were left dead on the field. Consult *The Cambridge Mediæval History*, vol. i (New York, 1911), and Edward Gibbon, *The Decline and Fall of the Roman Empire*, chaps. xxv–xxvi (ed. of J. B. Bury, London, 1912).

VALENTA, Eduard (1857–). An Austrian chemist, born in Vienna, where he was educated at the Polytechnic School and later became professor of photochemistry in the Graphic Educational and Experimental Institution. He received many honors. His numerous and important publications include: *Klebe- und Verdickungs-Mittel* (1884); *Die Photographie in natürlichen Farben* (1894); *Photographische Chemie und Chemikalienkunde* (2 vols., 1898–99); *Die Rohstoffe der graphische Druckgewerbe* (3 vols., 1904–14); and many contributions with Eder.

VALENTIA, vȧ-lĕn′shĭ-ȧ, or **VALENCIA**. A small island off the southwest coast of Ireland noted as the eastern terminus of the submarine cables between Great Britain and America (Map: Ireland, A 8).

VALENTIA. One of the five provinces into which Britain was divided under Diocletian, covering the portion of Scotland south of the wall of Antoninus.

VALENTIN, vä′len-tēn, Gabriel Gustav (1820–83). A German physiologist. He was born and educated at Breslau (M.D., 1832), where, with his teacher J. E. Purkinje (q.v.), he discovered ciliary epithelial motion. While professor of physiology at Bern (1836–81), he discovered the nuclei of cells (1836), and the diastatic rôle of the pancreatic fluid (1844), and he gave to medical science observations on many other important physiological phenomena. He wrote on the effect of poisons on animal organism, also *Lehrbuch der Physiologie des Menschen* (1844; 2d ed., 1847–50), and *Grundriss der Physiologie des Menschen* (1846; 4th ed., 1854).

VAL′ENTINE. The name of several saints and martyrs of the Christian Church. According to the *Acta Sanctorum*, on February 14 is observed the day of seven of them, and the veneration of the head of an eighth. These martyrs had lived in various parts of the world—France, Belgium, Spain, Africa—but the two greatest were a priest at Rome and a bishop in Umbria, both of whom lived in the third century. The legends which have been preserved in regard to them have little historical value. St. Valentine's Day is more famous, however, as a lovers' festival; this has no connection with the saints, but is perhaps the survival of an old festival, of a similar nature, in the Roman Lupercalia. It was observed particularly in England, but to a certain extent upon the Continent, too; mention of it is found as early as Chaucer. The custom was to place the names of young men and women in a box, and draw them out in pairs on St. Valentine's eve. Those whose names were drawn together had to exchange presents and be each other's valentines throughout the ensuing year. Later only the men made presents.

VALENTINE. 1. A character in Shakespeare's *Two Gentlemen of Verona*, one of the two whose humorous adventures give the play its title. 2. The brother of Gretchen in Goethe's *Faust*, by whom he is killed while trying to avenge the family honor.

VALENTINE. A sentimental romance by George Sand (1832).

VALENTINE, Basil. The pseudonym under which Johann Thölde published in 1644 a work entitled *Halographia*. For the origin of the name see Valentinus, Basilius.

VALENTINE AND OR′SON. A Carolingian romance, written in the second half of the fifteenth century and printed at Lyons in 1495. It narrates the history of twin brothers, sons of the Emperor of Constantinople. Orson grows up as a savage denizen of the forest, but Valentine is found by his uncle, King Pepin, and is trained at the palace to be a finished courtier. In 1589 Hathaway and Munday wrote a play founded upon the story, and six years later an interlude bearing the same title was produced.

VALENTINER, vä′len-tē′nēr, Wilhelm (1880–). A German art historian and critic and museum official. He was born at Karlsruhe (Baden), and studied at Heidelberg under Thode, and in Holland with De Groot and with Bredius, whose assistant he was at the Gallery of The Hague. In 1905 he was called to Berlin by Wilhelm Bode (q.v.), under whom he worked at the Kaiser Friedrich Museum and Kunstgewerke Museum. In 1907 he was appointed curator of the department of decorative arts in the Metropolitan Museum (New York), which under his supervision became one of the foremost in the world. After service at the front in the European War he was, in 1916, attached to the general staff at Berlin. Especially known through his writings on Flemish and Dutch painting, he published: *Rembrandt* (1907), and *Altholländische Genre Zeichungen* (1908), both with Bode; *The Art of the Low Countries* (1914); *The Last Years of Michelangelo* (1914). He also wrote important catalogues, including that of the Hudson-Fulton Loan Exhibition, *Dutch Masters of the Seventeenth Century* (1909).

VAL′ENTINE VOX, THE VENTRILOQUIST. A lengthy and once popular novel by Henry Cockton (1840), abounding in farcical situations produced by the hero's use of his gift.

VAL′ENTIN′IAN. A romantic drama by Fletcher produced before 1618–19, but not printed until 1647. It contains some very beautiful songs.

VALENTINIAN (Valentinianus). The

name of three Roman emperors of the same family. The most famous, Valentinian I (364–375 A.D.) was the son of humble parents, and was born at Cibalis, in Pannonia, in 321. Valentinian entered the army at an early age, and rose rapidly in rank under the emperors Constantius and Julian, only, however, to fall more rapidly; for he was degraded by Constantius in 357, and banished by Julian in 362. Restored to favor in 363 he distinguished himself in the East, and on the death of Jovian was unanimously chosen as his successor (Feb. 25, 364). A month after his accession he chose as his colleague his brother, Valens (q.v.), to whom he resigned the government of the East, reserving for himself Illyricum, Italy, the Gauls, Britain, Spain, and Africa. During Valentinian's reign the Alemanni repeatedly (366–368) ravaged the east and the Saxons (370) the northeast of Gaul; Illyricum was wasted (370) by the Quadi and Africa by the southern desert tribes, though these invasions were mostly repelled and avenged. The internal administration, on the other hand, was excellent, for the Emperor added to his ability prudence and firmness, vigilance and impartiality. Though himself a zealous Catholic he permitted his subjects to adopt whatever religion they chose, and strictly forbade all persecution or annoyance on account of religious belief. On account of the abuse of ecclesiastical influence he excluded priests and monks from the right of succession to property; it was forbidden to hold judicial proceedings in private; the extreme license of speech hitherto allowed to advocates was restrained; gratuitous medical attendance was provided for the poor of Rome; and schools were established throughout the Empire. The success of his administration was doubtless much owing to his fortunate choice of officers: Theodosius the Elder in Africa and Britain, Jovinus in Gaul, and Theodosius the Younger (afterward Emperor) in Illyricum. In private life Valentinian was above reproach, except for his violent temper. By his first wife he had one son, Gratianus (q.v.); and by the second, Justina, a son, Valentinian, and three daughters, one of whom, Galla, became the wife of the Emperor Theodosius I.

Valentinian II (375–392 A.D.), the younger son of the preceding, was born 372 A.D., and received from his elder brother, Gratianus (q.v.), the provinces of Italy, Illyricum, and Africa as his share of the Western Empire. During his long minority the Empress Justina administered the government; and about three years after her death Valentinian, who had given promise of good administrative qualities, was murdered at the instigation of the Frank, Arbogastes, the commander in chief of his army.

Valentinian III (425–455 A.D.), the grand-nephew of the preceding, was born about 419 A.D. and was seated on the throne of the West by Theodosius II, Emperor of the East, in 425. Valentinian was a weak and contemptible prince and may be said never to have ruled during the 30 years that he sat on the Imperial throne; his mother, Placidia, governed till her death in 450, and she was succeeded by the eunuch Heraclius. The regulations enacted for the internal administration were creditable, and especially so when ecclesiastical interests were involved, but the utter corruption of manners, the complete extinction of public spirit, the exactions of the tax collectors and commissioners, the employment of the powers of the executive in the avenging of private quarrels, and the impossibility of obtaining redress for injuries showed that the Empire had fallen far beyond remedy. The early part of Valentinian's reign was disturbed by the contests between the comites Bonifacius and Aëtius (qq.v.), the former of whom had supported and the latter resisted Valentinian's claims to the throne; but notwithstanding this, Aëtius prevailed upon the Empress to declare his rival, the Governor of Africa, a public enemy; and the latter called to his aid the Vandals under Genseric (q.v.). Thus Africa was lost to the Empire. But Aëtius, notwithstanding, proved himself the bulwark of the Roman power in Europe; the Franks, Goths, Burgundians, and other German nations who had encroached on the Empire were successively defeated and repelled, and the advance of the Huns was stayed on the field of Châlons. Yet the labor of defending an extensive empire from attack on all sides was too much for one man; and much of Spain and Gaul was seized by the Suevi and the Visigoths, the north of Italy was ravaged by the Huns, Sicily and Sardinia by the Vandals, and even Rome was repeatedly besieged, while Britain was abandoned to the Picts and the Scots. Aëtius seems to have committed the same error as his predecessor Stilicho (q.v.) in attempting, by the marriage of his son to Valentinian's daughter, to transfer the Imperial dignity to his own family, and, like him also, he was assassinated, though by the sword of his master (454). In 455 Valentinian was murdered by adherents of Petronius Maximus and of Aëtius. Consult: H. Richter, *Das Weströmische Reich unter den Kaisern Gratran, Valentinianus II, und Maximus* (Berlin, 1865); H. Schiller, *Geschichte der römischen Kaiserzeit*, vol. iii (Gotha, 1883–87); Thomas Hodgkin, *Italy and her Invaders* (Oxford, 1892); *The Cambridge Medieval History*, vol. i (New York, 1911); Edward Gibbon, *The Decline and Fall of the Roman Empire*, chapters xxv, xxvii, xxxiii-xxxv (ed. of J. B. Bury, vol. i, London, 1912); the article "Valentinianus," in Friedrich Lübke, *Reallexikon des Klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

VALENTINIANS. The most important Gnostic sect or school, founded by Valentinus, who went from Alexandria to Rome about 140 A.D. and died there, or in Cyprus, about 160. They recognized heathenism as a preparatory stage of Christianity, and divided the higher spiritual world into 15 pairs of æons, each consisting of a male and a female. The first pair, or syzygy, is made up of Bythos, or God in himself, and Ennoia, or God as existing in his own thoughts; from these emanated next Nous (Intelligence) and Aletheia (Truth), and so on. As the last æon, Sophia (Wisdom), transgressed the bounds that had been laid down by the æon Horos, and a part of her being became lost in Chaos, there was formed a crude being, called Achamoth, which, through the Demiurgos that emanated from it, created the corporeal world. Horos now imparted to the souls of men (for all the bodies composing the corporeal world are possessed of souls) a pneumatic or spiritual element, but this only attained to full activity when Christ, a collective emanation from all the æons, appeared as Saviour, and united himself with the man Jesus. In the end, all that is spiritual, and even the originally psychic or soul element in so far as it has assimilated itself to the spiritual, will return into the Pleroma. The Valentinians existed as late as the second half of the fourth century. See GNOSTICISM.

VAL′ENTI′NUS (?–c.160). The founder of one of the Gnostic sects which came into existence in the first half of the second century. According to Epiphanius (*Hær.* xxxxi, 2) he was born in Egypt, as some assert, of Jewish parents, and was educated in the Hellenic schools of Alexandria. During the reign of Antoninus Pius (about 140) he came to Rome, where he first appeared as an orthodox religious teacher. On his settling in Cyprus he became an open enemy to the Church and began to propagate his peculiar doctrines, for which see GNOSTICISM; VALENTINIANS.

VALENTINUS, BASILIUS. A German chemist and physician who lived in the latter part of the fifteenth century. Numerous writings, purporting to come from him, have been preserved, but in regard to his life the obscurity is so great that some extremists have even denied his existence, saying that the name is a pseudonym of Paracelsus (q.v.), with whom his works show great resemblance. Sounder scholars, however, maintain that he did live, having been born in Alsace, and being a Benedictine monk. His writings show a position midway between alchemy and modern science. The most complete edition of them is that published by Petrāus (Hamburg, 1740).

VALERA Y ALCALÁ GALIANO, vȧ-lā′rȧ ē äl′kȧ-lä′ gä′lē-ä′nō, JUAN (1824–1905). A Spanish statesman, diplomat, novelist, poet, and scholar, born at Cabra, in the Province of Córdoba. He was educated at Malaga and at the University of Granada, where he took his degree in law, and then entered upon a diplomatic career (1847). When the Duke de Rivas was sent as Spanish Ambassador to Naples Valera accompanied him. He was then a member of the Spanish legations at Lisbon (1850), Rio de Janeiro (1851–53), Dresden and St. Petersburg (1854–57). After his return to Madrid (1858) he became one of the editors of the liberal journal *El Contemporáneo* (1859). He was a leading member of the Unión Liberal, and was made Minister to Frankfort (1865) by General O'Donnell. After the revolution of 1868 he was appointed Assistant Secretary of State and (1871) Director of Public Instruction. During the reign of Alfonso XII he was Minister to Lisbon (1881–83), Washington (1883–86), and Brussels (1886–88), and in (1893–95) Ambassador to Vienna. Throughout all his diplomatic and political activity he produced works which rank among the highest that his country's literature contains. He was elected to the Spanish Royal Academy of the Language (1861) and to the Academy of Moral and Political Sciences (1900). He became life Senator (1881) and Knight Grand Cross of the Order of Carlos III (1882).

Valera really began the movement in fiction that was the glory of the last three decades of the nineteenth century in Spain with his *Pepita Jiménez,* first published as a serial in 1874 and since translated into many modern languages. *Pepita* was written after Valera had steeped his mind in the Spanish mysticism of the sixteenth and seventeenth centuries. His next novel, *Las ilusiones del doctor Faustino* (1875), the story of a modern Faust, did not catch the popular favor so quickly as *Pepita.* His third novel, *El comendador Mendoza* (1877), is free from philosophizing. After a shorter story, *Pasarse de listro,* appeared the *Doña Luz* (1879). Having abandoned politics, Valera wrote *El hechicero, Juanita la larga, La buena fama, Genio y figura, De varios colores,* and *Morsamor,* all attractive novels. The short tales of Valera are hardly less known and appreciated than his more extended works. Among them are the *Cuentos, diálogos y fantasías,* the delightful little *El pájaro verde,* the *Parsondes,* the *Asclepigenia,* the *Gopa,* and the *Bermejino prehistórico.* In the poetry of Valera his erudition is more visible than any other trait. By translating or paraphrasing in verse the poems of foreign authors, Valera acquainted his countrymen with portions of the poetic literature of Germany and the English-speaking regions; thus he rendered into Spanish verse parts of Goethe's *Faust,* of Uhland's ballads, and of Moore's *Paradise and the Peri;* poems of James Russell Lowell, Whittier, and W. W. Story. His translation of that gem of antiquity *Daphnis and Chloe* has itself become a classic. He also translated Schack's *Poesie und Kunst der Araber* (1881). His critical work displays great powers of observation, and gives evidence of wide reading. For purity of diction and beauty of style Valera has never been surpassed in Spain.

Consult: Juan Valera, *Obras Completas* (Madrid, 1905 et seq., 43 vols. to 1916); Ferdinand Brunetière, *La casuistique dans le roman de Juan Valera,* in his series *Histoire et littérature,* vol. i (Paris, 1884); Emilia Pardo Bazán, "Retratos y apuntes literarios," in *Obras completas,* vol. xxxii (Madrid, 1891 et seq.); Conde de Casa Valencia, *Necrología de . . . D. J. V.* (ib., 1905); Conde de las Navas, *Don Juan Valera* (ib., 1905); J. D. Fitz-Gerald, "Juan Valera," in *The Bookman,* vol. xxi (New York, 1905); F. Vézinet, *Les maîtres du roman espagnol contemporain* (Paris, 1907).

VALERA Y DELAVAT, vȧ-lā′rȧ ē dā′lȧ-vȧt′, LUÍS, MARQUIS DE VILLASINDA (?–). A Spanish diplomat and novelist, son of Juan Valera y Alcalá Galiano (q.v.). He served as Secretary of Legation at Peking, as Minister to Morocco, and as Minister to Portugal. Among his works are: *Sombras chinescas* (1902); *Visto y soñado* (1903); *Del Antaño Quimérico* (1905); *El filosofo y la tiple* (1908); *De la muerte al amor* (1910).

VALÈRE, vȧ′lâr′. A stock name for a lover in French classical comedy. In Molière's *L'avare* he is the son of Anseline and lover of Elise, Harpagon's daughter. The character occurs also in *Le dépit amoureux, L'école des maris,* and *Le médecin volant,* and in Mrs. Centlivre's *Gamester.*

VALERIAN, vȧ-lē′rĭ-an (OF. *valeriane,* Fr. *valériane,* from ML. *valeriana,* valerian; probably from Lat. *Valerianus,* prop. name, from *valere,* to be strong, able), *Valeriana.* A genus consisting of about 180 species of annual and perennial herbs of the natural order Valerianaceæ. The common valerian (*Valeriana officinalis*) is abundant in ditches, moist woods, etc., throughout Europe and northern Asia. Its fleshy root (*valerianæ rhizoma*) has been used in medicine as an antispasmodic and a stimulant to the nervous system and circulation—actions attributed to valerianic acid.

The active ingredient is a crystallizable volatile oil, from which is obtained by oxidation valerene ($C_{10}H_{16}$), valerol ($C_{12}H_{20}O$), also known as Baldrian camphor; and valerianic acid ($C_5H_{10}O_2$). The latter as a pharmaceutical product is derived from amylic alcohol by oxidation and is not identical with the natural acid. There are three official preparations, viz., the fluid extract, the tincture, and the ammoniated tincture. The volatile oil is not official, but is preferable to the tinctures which are extremely nauseating to many patients. In toxic doses valerian produces diarrhœa, vomiting, and mental disturbances.

The greater valerian (*Valeriana phu*), which grows in alpine districts of Europe, is now almost entirely disused, although, like *Valeriana dioscoridis*, it is very active. *Valeriana celtica* and *Valeriana saliunca*, are alpine species, found in Styria and Carinthia. *Valeriana sitchensis*, a native of the United States, is said to possess medicinal properties. The root of *Valeriana edulis*, a species found in northwestern America, is used as food by the Indians.

VALERIAN (PUBLIUS LICINIUS VALERIANUS). Roman Emperor 253–260 A.D. He was descended from an ancient and noble family, and was chosen for his integrity and accomplishments to the office of censor. Faithful in his allegiance to Gallus, he went to summon the legions of Gaul and Germany to aid the feeble Emperor against the usurper Æmilianus, but arrived too late to save his master. The usurper's troops murdered their own chief, and united with their late antagonists in proclaiming Valerian Emperor, August, 253. He was then about 60 years old, and took as colleague his eldest son, Gallienus (q.v.). Valerian showed abundant proof during his short reign of most ardent zeal for the prosperity of the Empire, but the times required a ruler of more energy and ability, as the irruption of the Franks into Gaul, despite the efforts of Aurelian, the devastation of Thrace, Macedonia, Greece, and the archipelago by the Goths, the advance of the Alemanni to Milan, and the conquest of Syria and Armenia by the Persian King Sapor (Shapur), testified. Since the troubles in the East appeared most threatening, Valerian went thither in person, and was for a time successful, but was surprised by superior numbers at Edessa, was defeated, and with the remnant of his army forced to surrender (260 A.D.). Valerian remained in captivity till his death. The statements regarding the indignities heaped upon the unfortunate captive by his haughty conqueror are probably false, or at least much exaggerated. After his death his skin was flayed off, stuffed, and preserved as a proud trophy of victory, which was invariably exhibited to the ambassadors from Rome to the Sassanid court.

VALERIANOS, vä'lä-rē-ä'nǫs, APOSTOLOS. See FUCA, JUAN DE.

VALERIC (vȧ-lĕr'ĭk *or* -lē'rĭk) or **VALE'RIAN'IC ACID.** A name applied to four distinct volatile fatty acids, all represented by the same formula, $C_4H_9.CO_2H$. The valerianic acid ordinarily met with, and used pharmaceutically, is often referred to as iso-valerianic acid. It is a limpid, colorless, oily fluid of a penetrating odor, similar to that of valerian root, and of an acrid taste. It boils at 174° C. (345° F.). It makes a transparent spot on paper, but the spot disappears on exposure to the air. It is only slightly soluble in water, but dissolves in alcohol and ether in all proportions. It exists in and is obtained by distilling valerian root with water acidulated with sulphuric acid. It may be similarly obtained from angelica root. It is also formed during the oxidation of fats and fatty acids (especially oleic acid), either by nitric acid or mere exposure to the air, by the oxidation and putrefaction of albuminoids, etc.; but the best method of preparing it is by distilling a mixture of amyl alcohol (or fusel oil) with bichromate of potash and sulphuric acid. An amino derivative of this acid, having the formula $C_4H_8(NH_2)CO_2H$ and named valine, is of considerable importance in biological chemistry.

The following salts are used in medicine: (1) Valerianate of ammonia, which forms colorless, or white, flat quadrangular crystals that are deliquescent in the air. (2) Valerianate of iron, a dark-red amorphous powder which is readily soluble in alcohol, but is insoluble in cold water. (3) Valerianate of zinc, which forms brilliant white pearly tabular crystals, with a feeble odor of valerianic acid and a metallic taste, is scarcely soluble in water, in alcohol, or in ether. Valerianic acid and its salts are supposed to be useful remedies for reflex neuralgia and for various neurotic troubles; but what their action consists in is entirely unknown. Amyl valerianate, $C_5H_{11}.C_5H_2O_2$, is a volatile fluid with a penetrating odor of apples, slightly soluble in water, but dissolving freely in spirit and in ether. In the form of a dilute spirituous solution, it so strongly resembles apples in its smell that it is used in perfumery under the name of oil of apples, or essence of apples.

The three other known valerianic acids are of much less importance than the one described above.

VALE'RIUS ANTIAS. A Roman historian of the first century B.C., who wrote the history of Rome from the earliest times down to those of Sulla. This work, which consists of at least 75 books, was full of exaggerations, but was mentioned among the well-known annals, and was one of the chief sources of Livy, who mentions Valerius by name repeatedly, and followed him unhesitatingly in the first decades of his work. Consult: H. Peter, *Historicorum Romanorum Fragmenta* (Leipzig, 1883), for the fragments of the *Annales;* W. S. Teuffel, *History of Roman Literature* (Eng. trans. by G. C. W. Warr, London, 1891); Martin Schanz, *Geschichte der römischen Litteratur*, vol. i, part ii (3d ed., Munich, 1909).

VALERIUS CORVUS, MARCUS. See CORVUS, M. V.

VALERIUS FLAC'CUS. A Roman scholar and teacher. See FLACCUS, GAIUS VALERIUS.

VALERIUS MAX'IMUS. A Roman historical compiler of the reign of Tiberius, to whom he dedicated a work bearing the title of *Factorum et Dictorum Memorabilium Libri IX*, and consisting of short stories and anecdotes from various authors. His style is ornate and often obscure, and his want of acquaintance with the history and constitution of his country renders him an unsafe guide; yet he was a favorite author of his own time, and much studied in the Middle Ages. The best edition, including the two epitomes by Julius Paris and Januarius Nepotianus, is that of Kempf (Leipzig, 1888). There is an old English translation by Speed (London, 1678). Consult W. S. Teuffel, *Geschichte der römischen Literatur*, vol. ii (6th ed., Leipzig, 1909); Martin Schanz, *Geschichte der römischen Litteratur*, vol. ii, part ii (3d ed., Munich, 1913).

VALERIUS PROBUS, Marcus. See Probus, M. V.

VALE′SIUS, Henricus (Henri de Valois) (1603–76). A classical scholar, born in Paris. He was chosen by the clergy of France to publish an edition of all the Greek authors whose writings deal with the early history of the church, and, in 1654, he was given a pension and the title of Royal Historiographer. His publications include the ecclesiastical histories of Eusebius, Socrates, Sozomen, Theodoret, and Evagoras, all of which were accompanied by Latin translations and scholarly introductions and notes (1659–73); a collection of excerpts from the Greek historians, especially Constantine Porphyrogenitus, known as the *Excerpta Peiresciana* (1634), and an edition of Ammianus Marcellinus (1636). His minor works were published under the titles *H. Valesii Emendationum Libri V* and *De Critica Libri II* (1740).

VALETTA, vȧ-lĕt′tȧ. The fortified capital of Malta, located on the east side of the island (Map: Italy, E 7). The city is on a tongue of land, which forms two harbors and terminates in a narrow promontory bearing the lighthouse and fort of St. Elmo. In addition to St. Elmo there are three other important fortifications, government and private dry docks, a coaling station, a marine hospital, and quarters for troops. The principal architectural features are the governor's residence, formerly the palace of the grand masters of the Knights of Malta or St. John, and the cathedral, containing tombs of the Knights. The town has a university, library, botanical garden, and museum. In parts of the city the streets are broad and run at right angles to each other; in others the land is so steep that the streets are practically stairways. Valetta has a large transit trade, and is an important British naval station. Pop., 1901, 22,680; 1911, 22,882. In 1565 Valetta withstood a memorable siege by the Turks, against whom it was successfully defended by Jean Parisot de la Valette (q.v.). See Malta.

VALETTE, vȧ′lĕt′, Jean Parisot de la (1494–1568). Grand Master of the Knights of St. John of Jerusalem (q.v.). He was born in Toulouse, and at an early age entered the Order of St. John. His chief distinctions were won in naval service in the Mediterranean. In 1557 he was elected Grand Master, the forty-eighth to hold that office. During the first five years of his grandmastership he captured 50 great galleys from the Turks, and a large number of smaller vessels of war. In May, 1565, a Turkish fleet said to have been composed of 150 ships, conveying 30,000 troops, appeared off the harbor of Malta, and after failing in several assaults, formally invested the island. Alone and unsupported by any of the Christian Powers, La Valette, with about 700 knights and 8000 men at arms and islanders, defended the fortress under circumstances of extreme difficulty and distress. At the end of four months, and after a loss, it is said, of 20,000 men, the Turkish fleet was forced to raise the blockade and withdraw from the island. La Valette died three years later, Aug. 15, 1568. Consult Jurien de la Gravière, *Les chevaliers de Malte et la Marine de Philippe II*, vols. i–ii (Paris, 1887).

VAL′GIUS RU′FUS. A Roman poet of the Augustan age. Horace (Sat. i, 10, 82) mentions him among those friends whose commendation outweighs the criticisms of detractors. He is said to have written elegies, epigrams, and works on botany and grammar. Consult Peter, *Historicorum Romanorum Fragmenta* (Leipzig, 1883).

VALHALLA, vȧl-hăl′lȧ (Old Norse *valhöll*, gen, *valhallar*, hall of the slain). In Old Norse mythology, the abode of Odin in Asgard, the hall of the fallen in battle. It stood in Gladsheim (Old Norse *Gladhsheimr*), the home of joy. The roof of it was of gold, and in front of it was the grove Glasir, the trees of which bore golden leaves. Before the house, which was so high that its summit could scarcely be seen, a wolf was hung, as a symbol of war, over which sat an eagle. The hall itself, ornamented with shields, wainscoted with spears, and lighted with shining swords, had 540 doors, through each of which 800 heroes could walk abreast. Every morning they marched out at the crowing of the cock, and fought furiously with one another; but at midday all wounds healed, and the heroes assembled to the feast under Odin's presidency. The guests ate of the bacon of the boar Sæhrîmnir, and refreshed themselves with beer and mead, which flowed in abundance from the udder of the goat Heidrun (Old Norse *Heidhrunr*), fed by the tree Lærad (Old Norse *Læradhr*) which rose above the hall, while the attendant Valkyries handed them the drinking horns, under Freyja's direction. See Odin; Valkyries. Consult R. B. Anderson, *Norse Mythology* (Chicago, 1875; 7th ed., ib., 1901).

The name Valhalla is also given to a German temple of fame, situated about 7 miles east of Regensburg, Bavaria, on the heights above the Danube valley. This singularly beautiful and imposing structure was erected under Louis I. It was designed by Klenze, and completed in 1842. It is built of gray marble, in close imitation of the Parthenon, and is 246 feet long and 115 feet wide. Fifty-two Doric columns surround it. The interior is Ionic, forming a hall 50 by 180 feet and 56 high. Schwanthaler, Wagner, and Rauch had charge of the decorative features. The number of busts of eminent Germans in 1911 was 165, and there are six Victories (goddesses) by Rauch.

Consult: King Ludvig I, *Walhallas Genossen* (Munich, 1842; 2d ed., ib., 1847); Adalbert Müller, *Donaustauf und Walhalla* (33d ed., Regensburg, 1898); Schratz, *Kurze Geschichte und Beschreibung der Walhalla und des Markts Donaustauf* (8th ed., ib., 1904).

VALHORN, Joseph Gasser von. See Gasser von Valhorn, Joseph.

VALIANT-FOR-TRUTH. A character in the second part of Bunyan's *Pilgrim's Progress*, who joins the company of Christiana on her journey to the Celestial City. He combines the noble qualities of a mediæval crusader with the homely virtues of the English middle classes of the seventeenth century.

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